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ABSTRACTS OF CURRENT LITERATURE

COTTON IN INDIA.

1. INDIAN COTTON: REVIEW OF THE 1940-41 SEASON. We have received from Messrs. Chunilal Mehta & Co., Bombay, a copy of their *Indian Cotton Review for the 1940-41 Season.* The area under cotton totalled 22,902,000 acres, compared with 21,580,000 acres in the previous season. Production was estimated at 5,785,000 bales of 400 lb. against 4,909,000 bales during 1939-40. The yield per acre was 101 lb., compared with the figure for 1939-40 of 91 lb. per acre. The crop, on the whole, made very favourable progress during the growing season. Exports totalled 2,097,000 bales, a decline of about 12 per cent. from the previous season's total of 2,381,000 bales. Consumption of Indian cotton by mills in India during the year constituted an all-time record at 3,580,000 bales, compared with 3,019,000 bales for 1939-40. An interesting section of the Review under the title of "Looking Ahead" deals with the prospective position of Indian cotton during the 1941-42 season.

The usual statistical tables are included in the report, dealing with cotton acreage; production; world supply, distribution and stocks of Indian cotton; consumption by mills in India; Bombay cotton prices, etc.

2. REPORT ON THE STAPLE LENGTH OF THE INDIAN COTTON CROP OF THE 1940-41 SEASON (*Stat. Leaflt. No.* 1, 1941. Ind. Cent. Cott. Comm.) The crop of 1940-41 is estimated by the Government to produce in bales of 400 lb.:

Long staple, over 1 inch	107,000
Medium staple, $\frac{7}{8}$ to 1 inch	1,971,000
Short staple, below $\frac{7}{8}$ inch	3,707,000
Grand total	5,785,000

3. INDIA: COTTON IMPORT DUTY. (*Cotton,* M/c., 31/1/42, p. 1.) It is stated that the Government of India has imposed an additional import duty of 1 anna per lb. on raw cotton. The proceeds of this will be credited to a special fund to be utilized for the financing of measures to benefit growers of short-staple cotton in India. This follows the announcement that the Government was taking immediate steps to steady the cotton market by purchasing lower grades of cotton previously exported to Japan, and will also finance measures designed to assist cultivators to change over from short-staple cotton to crops more useful in present circumstances.

4. INDIA: ADVISORY PANEL FOR THE COTTON TEXTILE INDUSTRY. (*Cotton, M/c.*, 31/1/42, p. 5.) The constitution of an Advisory Panel of the cotton textile industry has been officially announced. It consists of two representatives each of the Millowners' Associations of Bombay, Calcutta, and South India, and of the Upper India Chamber of Commerce, Cawnpore, and one representative each of the Millowners' Associations of Bengal, Baroda and Indore. The panel will be summoned from time to time by the Directorate-General of Supply, and will advise on matters relating to the demands on the textile industry caused by the war, the best methods of speeding up production, the allocation of war supply orders to the various units of the industry, and the principles on which prices should be fixed.

5. INDIAN CENTRAL COTTON COMMITTEE. (*Curr. Sci.*, **10**, 1941, p. 93. From *Pl. Bre. Abstrs.*, xi., **4**, 1941, p. 257.) According to this brief report of the Second Conference of Scientific Research Workers on Cotton, held in Bombay, January 19-21, 1941, cotton breeding figured largely in the discussions. The need for a complete survey of cottons in Eastern Bengal, Assam and Burma and for a more intensive programme of hybridization was urged. Interest was shown in the Asiatic-American crosses being studied at Surat. The view was expressed that a very prolific, very short-stapled cotton would under present conditions command a limited market. The Technological Laboratory has advanced the percentage of the variation in spinning performance which can be accounted for in terms of fibre properties from 86 to 89 per cent. by taking into account fibre length, fibre weight per inch and swollen hair diameter. The problem of breeding a completely wilt-resistant cotton was discussed. Encouraging results from a technique worked out at Poona were reported, and the desirability of co-operation between different specialists was emphasized.

6. INDIAN CENTRAL COTTON COMMITTEE: REPORT OF THE TECHNOLOGICAL LABORATORY, 1940-41. (Ind. Cent. Cott. Comm., 1941. Price 6 annas.) A report of increased progress in all sections of the Laboratory. The total number of samples tested reached the record figure of 1,800, compared with 768 for the previous season, which also constituted a record. The work at the Testing House made remarkable progress, 1,120 samples being tested there, against 304 in 1939-40. The Spinning Laboratory, Technological Research and Moisture Testing Sections were all fairly occupied during the year. A noteworthy event during the period under review was the inauguration of a new Ginning Section which made it possible to carry out ginning tests with various speeds, settings, etc., on different varieties of Indian cottons.

During the season 3 bulletins and 36 circulars were issued, and in addition 2 papers were contributed to be read at the 2nd Conference of Scientific Research Workers on Cotton in India held in Bombay in January, 1941. Summaries of these publications are included in the Report.

7. IMPROVEMENT IN INDIAN COTTON. (*Ind. Farming*, July, 1941, pp. 376-382.)

Medium-Stapled Cotton in Bombay. By B. S. Patel. (p. 376.) At the cotton-breeding station at Jalgaon in Bombay Province, selection work in the Verum strains has resulted in a wilt-resistant strain, Jarila, which is far superior to the local NR cotton. It has white, shining lint of $\frac{7}{8}$-in. staple, and spins 30 counts against 7 counts for NR. Arrangements have been made through approved agents and co-operative societies to stock pure Jarila seed sufficient for 150,000 acres, and to organize 49,000 acres seed area in different stages during the coming season.

Cotton Research in the United Provinces. By C. M. Das. (p. 379.) A scheme, financed by the Indian Central Cotton Committee, for the improvement of

Bengal cottons is being carried out. Hybridization work in progress comprises the crossing of three improved varieties of United Province's cottons, C520, C402, and Perso-American with other standard types obtained from outside the province.

Cotton in Mysore. By M. Vasudevamurthy. (p. 382.) A concentrated scheme of cotton cultivation has been launched in the Maddur and Malavalli talukas, the tracts fed by the distributaries of the Irwin Canal. Experiments have indicated that the red loamy soils are specially well suited to long-stapled cotton, and these cottons do particularly well under irrigation and meet the requirements of the mills in Mysore.

8. The Indian Journal of Genetics and Plant Breeding. See Abstr. 214 in this issue of the Review.

9. Plant Breeding and Genetical Work in India. By K. Ramiah. See Abstr. 216 in this issue of the Review.

10. Indian Central Textile Research Laboratory: Plea for Establishment. By J. V. Saraiya. (*Ind. Text. J.*, **52**, 1941, p. 32. From *Summ. Curr. Lit.*, xxii., **2**, 1942, p. 55.) The writer points out that, as a result of the war, the Indian textile industry has gained from the placing of large Government orders and the cutting off of Japanese competition in home and other markets, and suggests that some of the profits should be devoted to the establishment of a Central Textile Research Laboratory for the development of methods of increasing the technical efficiency of the mill industry and making it independent of foreign imports, such as machinery, spare parts, bleaching materials, dyes, etc., so as to ensure its survival in the post-war period. The work of the Technological Laboratory, run by the Indian Central Cotton Committee, does not extend to the production of machinery, dyes, etc. In Bombay Presidency, which in 1939 had 6,016,297 spindles and 73,705 looms against 10,059,370 spindles and 202,469 looms in the whole of India, there are only two important institutions that give special training in textile subjects and carry out research connected with the industry. Accommodation in these institutions is limited, and there is great demand for the trained men. There is at present great scope in India for starting the feeder lines of the industry such as the manufacture of dyes, bleaching agents, machinery, etc., but private enterprise is discouraged by the lack of institutions to carry out preliminary research work.

11. Scientific Reports of the Imperial Agricultural Research Institute, New Delhi, 1939-40. (Manager of Pubns., Delhi, 1941. Price Rs. 2-6, or 4s.) A report of steady progress in the research work carried out during the season in the different branches of agricultural science. Cotton is not included.

12. Industrial Development in India. By S. Lall. (*Text. Mnfr.*, lxvii., **795**, 1941, p. 100.) Encouragement of Indian industrialization includes the hand-loom industries. So far as hand-spinning is concerned, the cottage worker is unable to hold his own against the mills, and his remuneration is so small that even as a spare-time occupation it is of little material value. The position is otherwise with the hand-loom weaving industry. This has shown astonishing vitality in face of severe competition from the mills. In 1913-14 60 per cent. of the total consumption of cotton piecegoods in India was imported, 20 per cent. was supplied by Indian mills, and 20 per cent. by hand-loom production. The corresponding percentages in 1936-37 were 13 per cent. imported, 61 per cent. by Indian mills, and 26 per cent. by hand-loom. Thus the expansion of the Indian mills has been at the expense of foreign mills and not of the indigenous hand-loom industry. This cottage industry requires little capital and the overhead expenses are negligible. It is better suited than the mills to meet a

local demand for a particular style or design of cloth—for instance, the complex Sambalpur saris. The hand-loom worker can produce individual designs, whereas the mills can only manufacture to a standard pattern.

13. Indian Hand-Loom Weavers. (*Cotton*, M/c., 13/12/41, p. 5.) The war has given an impetus not only to the mill industry in India, but also to the hand-loom industry. Orders so far placed since the outbreak of hostilities for hand-loom blankets have already passed the impressive total of 1,000,000 of the approximate value of Rs. 70,000,000 to Rs. 75,00,000. The cottage industries are also engaged in weaving a fairly wide range of articles such as webbing, tapes, durries, cordage, etc., for which there are considerable war demands.

14. Indian Cotton: New Uses. By N. Ahmad. (*Ind. Text. J. Jubilee Souvenir*, 1890-1940, issued 1941. From *Summ. Curr. Lit.*, xxii., 4, 1942, p. 86.) The spinning capacity of Indian cottons is reported as an introduction to a discussion of the problem of disposing of an annual surplus of some 1½ to 2 million bales of short cotton, and the author advocates a programme of increasing the uses of cotton for other than clothing and household purposes. The work of United States authorities on such lines is discussed.

15. Secret Bidding in the Cotton Trade. By P. L. Tandon and F. Haq. (*Ind. Frmg.*, October, 1941, p. 518.) Describes the " cover " system of bargaining in cotton obtaining in the Punjab and in some of the cotton markets of the Central Provinces and Berar.

16. The Desert Edge of Indian Agriculture. By Dr. W. Burns. (*Ind. Frmg.*, October, 1941, p. 509.) An article dealing in the main with the problems and potentialities of agriculture in the dry areas of Rajputana and the adjoining and comparable parts of Sind and the Punjab. The various sections are headed: Dry Farming; Scope for Tractor Cultivation; What to Grow; Importance of Earliness; Grassland Management; Fodder Trees; Subsoil Irrigation; Need for a Desert Laboratory.

17. Sons of the Soil. By Dr. W. Burns. (Manager of Pubns., Civil Lines, Delhi. Price Rs. 2-6, or 4s. From *Ind. Agr. J.*, xi., 4, 1941, p. iii.) The object of this book is to show the variety of individuals and classes who cultivate the soil of India. There are many publications for those who desire rows of figures or discussions of rural economics; these sketches attempt no competition with such books, but aim at giving the idea of the cultivator as a man, and not as an economic unit. It is hoped that they may be of use in many ways, and perhaps, not least, in letting one half of India know how the other half lives.

18. Madras: Cotton Research, 1939-40. (*Rpt. Operns. Dpt. Agr. Madras*, 1939-40.) One hundred and fourteen American varieties imported from different countries were tried out at the Coimbatore Cotton Breeding Station, but all proved susceptible to jassid and unsuited to local conditions. Those with the best lint length and earliness were, however, used for crossing with Co.2. The progenies of the crosses between the two strains X3915 and X4383 were more promising. The lint of X3915 was stated by the Director, Technological Laboratory, Bombay, to be suitable for spinning 50's. It fetched a premium of Rs. 25 per 784 lb. over that of Cambodia, and growers consider that its introduction will benefit them to the extent of Rs. 25 per acre when raised as a summer crop. The performances of strain 920 over the past five years were found to average Rs. 8 per acre more than Co.2, in spite of its shorter and coarser lint. In work on the improvement of indigenous cottons K.1 still retained its superiority over other strains. A new fully fertile tetraploid cotton was obtained by treating with colchicine a partially fertile cross between Karunganni and an

African wild cotton. It was found to possess finer lint than Karunganni and to cross freely with American varieties, and should prove useful for black soil tracts.

19. Mysore: Cotton Cultivation. (*Mysore Agr. Cal.*, 1941-42.) The cultivation of Mysore-American cottons (M.A. II.) in areas never previously cropped to cotton met with success. This strain has fine lint, high yield, and great resistance to red leaf blight, and it is rapidly replacing the Local Doddahathi and Gadag No. I. In the black cotton soil area, improved Sannahathi (Asiatic) varieties introduced were H. 190, Sel 69 and C.N. 86. Strains 199 and 260-61 are under multiplication for release to cultivators during the next season.

20. Mysore Cottons and their Improvement. By V. N. Ranganatha Rao. (*Mysore Agr. and Exp. Union Jour.*, 18, 2, 1939, p. 57. From *Cott. Lit.*, July, 1941, p. 264.) Concerns two new strains of cotton possessing red flower and green seed developed from interspecific hybridization between *G. arboreum* and *G. herbaceum*.

21. A Study of Forecasting of the Cotton Crop in the Punjab. By R. S. Koshal. (*Ind. J. Agr. Sci.*, xi., 3, 1941, p. 374.) Examination of the forecasts of the cotton crop in the Punjab for several seasons showed them to be recurring under-estimates, and a revision of standard yield figures became necessary. An extensive statistical examination was undertaken of all the crop-cutting experiments and other data for the period 1932-37 in order to evolve a suitable method for determining the average yield of both irrigated and unirrigated *desi* and American cottons for each district. As a result of the investigation new standard yield figures are given representing the average production in lb. of lint per acre for each district and type of cotton. They are considerably higher than the old figures, the provincial standard yields for *desi* and American cotton being raised from 123 and 130 lb. to 193 and 195 lb. respectively. The revised district yields wlll be a guide for future forecasts, and it is hoped that the dangers of under-estimation will be reduced.

22. Some Irrigation Problems in the Punjab. By E. McKenzie Taylor and M. L. Mehta. (*Ind. J. Agr. Sci.*, xi., 2, 1941, p. 137.) The various sections of this paper deal with the following: The rivers of the Punjab and their associated irrigation systems; the construction and maintenance of canal systems; the rise of the water-table and water-logging; the deterioration of the land due to the accumulation of sodium salts; tube wells; distribution of irrigation water and the method of assessment; rainfall, run-off and soil erosion.

Diagrams illustrate the effects on salt distribution in the profile resulting from the introduction of irrigation and the growth of cotton and rice. In the case of cotton it will be seen that irrigation has caused a redistribution of salts originally present in the soil crust. A zone of salt accumulation has been formed similar to that which had been shown to be present in the normal irrigated areas. In the case of rice no zone of accumulation has been formed, but the salt appears to have been washed completely from the soil crust into the underlying sand layer. These observations have important applications to both the prevention of land deterioration and its reclamation. Having established that a zone of salt accumulation was formed under cotton irrigation, the subsequent history of this zone with different crops was studied. It has been established that if the irrigation water supplied is sufficient to moisten the soil to the depth of the zone of salt accumulation, but is insufficient to balance that lost by transpiration and evaporation, then the tendency is for the zone of salt accumulation to move towards the surface. If the amount of irrigation water is sufficient to counterbalance the losses due to transpiration and evaporation, then the zone of

accumulation of salt remains stationary or moves in a downward direction. It seems, therefore, that in the Punjab it is necessary to study not only the water requirements of the crops, but also the water requirements of the soil with respect to the possibility of deterioration.

23. SIND: COTTON REGULATION.* (*Cotton*, M/c., 29/11/41, p. 6.) To prevent admixture of a superior variety of cotton with inferior strains and to stimulate cultivation of American long-staple cotton as "money crop," for which Sind is particularly suited, the Government propose to regulate the cultivation of cotton. As a first step the Government contemplate bringing forward a Bill seeking to restrict the area under *desi* cotton to certain tracts only, particularly in Nawabshah district and a division in Thar-Parkar.

24. UNITED PROVINCES: COTTON RESEARCH, 1939-40. (*Ann. Admin. Rpt. of Dpt. Agr., Un. Prov.*, 1939-40, recently received.) "The work during the year included a collection and study of indigenous cottons, selection and breeding work, irradiation response studies, varietal and agronomical tests, rotational and growth studies, wilt resistance, spacing effect on pink bollworm incidence, and sowing time and environmental effects on spinning quality. In the selection and breeding part of the work, examination, purification, and replicated trials continue on the material derived from the original field survey collections. . . . Under cultivators' conditions as in the past, C. 402, C. 520 and Perso-American cottons were tested against the local cotton. The results in general indicated the superiority of C. 520 and Perso-American over all others. C. 402 gave the poorest performance."

25. A NOTE ON THE CULTIVATION OF IMPROVED VARIETIES OF COTTON IN THE UNITED PROVINCES. By B. L. Sethi. (*Bull. Dpt. Agr., U.P.*, 84, 1941, p. 5. From *Pl. Bre. Absts.*, xi., 4, 1941, p. 257.) Accounts are given of the two improved cotton varieties, C. 520 and Perso-American, which have been produced by the Department. C. 520 (*G. arboreum*) was extracted from the indigenous cottons of Saharanpur. It is characterized by early maturity, hardiness to withstand adverse weather conditions, and high yielding capacity. It has a ginning outturn of 38 per cent. and a staple length of 11/16 to 13/16 inch. Perso-American (*G. hirsutum*) is a selection from American types imported from Persia by the Department. In quality the variety is definitely superior to C. 520, and it yields at least as much as that cotton. It has a ginning outturn of 32 per cent. and a staple length of 28/32 inch.

COTTON IN THE EMPIRE (EXCLUDING INDIA).

26. AGRICULTURAL MARKETING IN THE COLONIAL EMPIRE. By H. A. Tempany. (*Emp. J. of Exp. Agr.*, x., 37, 1942, p. 1.) The prosperity of the agriculturist and his progress in efficiency depend to a large extent on the marketing of his produce. The outbreak of war emphasized the importance of marketing problems in the Colonial Dependencies, particularly in regard to foodstuffs, since the stimulus given to increased local production was unlikely to be effective unless adequate marketing arrangements existed. To ascertain directions in which further efforts to improve matters might be desirable, information concerning agricultural marketing conditions in the Dependencies was collected in 1940 on the initiative of Sir Frank Stockdale, from which a detailed survey of the position was made, but the publication of this survey had to be postponed until after the war. In the present paper, Dr. Tempany, who succeeded Sir Frank Stockdale as Agricultural Adviser at the Colonial Office, has given an account of the more important features of the position.

Dr. Tempany points out that there has been marked progress in the organization of agricultural marketing in the Colonial Dependencies of recent years, but

efforts have been mainly concentrated on products for export; local marketing has been somewhat neglected, and greater attention should be paid to this aspect of the question. The most far-reaching developments are the international regulation schemes for rubber, tea, and sugar, which are designed to stabilize market prices by adjusting production to demand, and from their success it would appear not improbable that in due course the principle of controlled production may be extended to other commodities. War conditions have perforce brought about great changes in the marketing of many colonial products: the demands of the military situation, food requirements in the United Kingdom and elsewhere, the supply of war materials, and the shipping position have necessitated Government intervention on the grand scale, and the control of production, transport and marketing of the majority of agricultural commodities, together with a large measure of price control. A considerable relaxation of these measures must occur when peace is resumed, but the experience gained in connection with them may lead to far-reaching modifications of marketing systems in the post-war period.

Dr. Tempany then reviews the main features of the marketing position, as it existed prior to the outbreak of war, in the West African Dependencies, East Africa, Eastern Dependencies, West Indies, Mediterranean Dependencies, and the Western Pacific and Atlantic.

In the general summary following the author refers to the marketing of smallholders' produce, and points out that frequently this has achieved greater organization in industries which require elaborate processing of the produce before export—*e.g.*, in the sugar and cotton industries—necessitating the erection of factories. On the other hand, where the smallholder turns out produce ready for export—*e.g.*, cocoa, rubber, or tobacco—the situation is more difficult, and sales tend to remain in the hands of the middlemen buyers. In such cases there appears to be scope for the provision of more central depots for processing and for the further extension of centralized selling, which would lead to the elimination of destructive competition. The question of indebtedness is also an extremely important factor, since the burden of debt weighs heavily on the smallholder and handicaps his efficiency. Interest rates are often exorbitant, and when the cultivator makes repayment to the trader in produce the price given may be substantially below the market price, and, moreover, the borrower is precluded from selling in the open market, and thus gaining the benefit from competitive demand. Co-operative marketing in conjunction with credit facilities is the obvious remedy, and some progress has been made in this direction, but much still remains to be done.

In the discussion which concludes the paper Dr. Tempany states that the comparative neglect of internal marketing is unfortunate for the well-being of colonial peoples, since the rise in their standard of living, whether they are regarded as buyers or sellers, is in many areas more dependent on a well-organized internal trade than on the export market. An essential condition for the diversification of agriculture in such areas is the creation of an adequate organization of internal markets for produce, without, however, relaxing efforts in regard to export commodities. Other points stressed by the author are the necessity for further study of the actual processes of marketing, the provision of greatly increased staffs of trained native supervisors of markets to ensure that existing or new markets are properly organized and run, and the fuller education of the people at large if the full benefits are to be derived from a wider exchange of goods of every kind.

27. Agriculture in the British Colonial Dependencies. By H. A. Tempany. (*Crown Colonist*, March, 1942, p. 165.) A brief review of the situation

in regard to food production in the Dependencies in 1941, and of the condition of the major crops of sugar, bananas, cacao, oilseeds, rubber, cotton, tea, and vegetable drugs. The progress made in research and education is also discussed. The author writes in conclusion that "while war conditions have affected the position in an increasing degree, there is good reason to believe that in many respects the changes that have been brought about as a result will be in the end productive of benefit, and that the foundations are being laid for a more stable system of agriculture in the post-war period."

28. ASIA. BURMA: COTTON ACREAGE, 1941-42. (*Cotton*, M/c., 20/12/41, p. 6.) The area sown to cotton is estimated at 418,000 acres, as compared with 421,000 acres, the actual area under cotton in 1940-41. The condition of the crop is reported to be satisfactory except in certain areas, where more rain is needed.

29. CEYLON: COTTON INDUSTRY, 1939-40. (*Admin. Rpt. of Actg. Dir. Agr.*, 1940, recently received.) The year was a relatively favourable one for cotton cultivation, and a total of 2,315 cwt. was sold to the Spinning and Weaving Mills, Wellawatta, the amount paid to growers being Rs. 24,259.66. The figures for the previous season were 1,679 cwt. and Rs. 14,259.76 respectively. Unfortunately, unseasonal floods occurred at the time when much of the cotton purchased from the cultivators was awaiting transport to the mills, and some of it was damaged, with the result that the Cotton Purchase Scheme resulted this year in a loss to Government of nearly Rs. 2,000.

Experiments were carried out with the object of improving the quality and yield of local cotton. A demonstration of what can be produced in Ceylon was given at Embilipitiya Station, where 1 acre of cotton yielded 9 cwt. seed cotton. Of this, however, 3 cwt. were "second crop" cotton produced during the *yala* season. "Second crop" cotton is considered to be of inferior quality, and its collection is not recommended in Ceylon. The area in question was manured only with compost manure, and the soil is typical of the district where normal yields are 3-4 cwt per acre.

Thirteen more cotton varieties were imported for trial at Tissamaharama; they included five Egyptian or Sea Island strains, and the remainder American Uplands. A further field trial was made with the strains imported previously.

30. AFRICA. NIGERIA: COTTON INDUSTRY, 1939-41. (*Ann. Rpts. Dpt. Agr.*, 1939 and 1940, received 1942.) 1939-40 *Season*.—In the Northern Provinces the rise in cotton prices and the favourable weather conditions experienced resulted in a very satisfactory increase in the cotton purchased for export. The action of the Nigerian Railway in further reducing the cost of transport of cotton seed by their road transport services from 4d. to 3d. per ton mile was greatly appreciated as enabling more seed to be distributed than would otherwise have been possible. In the Southern Provinces the cotton crop suffered severe damage from *Helopeltis*, and on many farms the Ishan crop was completely destroyed.

1940-41 *Season*.—In the Northern Provinces the crop was the largest on record, being approximately 64,900 bales. There is now a group of strains in the Northern Provinces giving much higher yields than the ordinary Allen cultivated. They have slightly different characteristics from the ordinary commercial type when spun into yarn, and careful enquiries are being made concerning the extent and value of the market for such cottons. In the Southern Provinces production amounted to approximately 4,591 bales, compared with 1,300 bales in 1939-40. Annual single plant selection of Ishan A. remains the basis of the cotton breeding work in the South. On the advice of the Corporation's expert the intercrossing of Ishan × Sea Island has been discontinued and attention devoted to a really

strong and rough-linted Ishan type of cotton. An Agricultural Technical Assistant visited the Ishan district during the season and made rough-linted selections from among plants on native farms; these will be grown and further examined at Ibadan during the 1941-42 season.

For many years the Empire Cotton Growing Corporation has maintained a cotton-seed multiplication farm at Daudawa in Southern Katsina. In order to ensure that the work done there fitted in as closely as possible with the work of the Agricultural Department the Corporation offered to transfer the control of the farm to the Department. The offer was gladly accepted and the farm was handed over on April 1, 1941. The Corporation is contributing £1,600 per annum towards the upkeep of the estate for a period of five years. The Dept. of Agriculture places on record its appreciation of this generous gesture and also of the help which it has received from the Corporation and its staff ever since Daudawa was established.

31. Nyasaland: Cotton Industry, 1939-40. (*Ann. Rpt. Dpt. Agr.*, 1940, received 1941.) The number of growers in the whole Protectorate showed an increase of 17 per cent. over the previous season, the increase occurring mainly in the Lower Shire and Central Shire areas, and being some 33·6 per cent. throughout the Southern Province. In the Northern Province, however, with the exception of the North Nyasa district, which showed an increase of nearly 66 per cent., there was a decrease in all districts, and for the whole Province there was an 11 per cent. decline in the number of growers, and production here was some 220 tons less than in 1939. Lack of attention to gardens in the Ncheu, Dedza, and Dowa districts was mainly responsible for this reduction, as yields at the Domira Bay Station of the Empire Cotton Growing Corporation were exceptionally good, the mean being 973 lb. seed cotton per acre. The total cotton crop for the Protectorate of 3,520 tons, of which private estates produced 508 tons, showed an increase of approximately 23 per cent. on the previous season's figure. Prices averaged 1·131d. for No. 1; 0·563d. for No. 2; and 0·272d. for No. 3 grade.

The season was very favourable at the Domira Bay Station, the cotton crop reaching a new high record. Experimental work with various strains confirmed that the U.4 × Cambodia × U.4 cross gave the best yield. Investigations in connection with cotton pests were continued by the Insect Pest Control Staff of the Corporation, and progress was made in the accumulation of information regarding the two major pests, red bollworm and stainers.

32. Cotton Industry, 1940-41. (*Nyasaland Agr. Qrtrly. J.*, July, 1941, p. 4.) Cotton markets opened during July and estimates given in June of 840 tons of seed cotton in the Southern Province and 355 tons in the Northern Province (excluding Northern Nyasa) are expected to be realized. The Cotton Auction held in June represented a return to growers on or near the railway line of over one penny per pound for Grade 1 seed cotton, which is considered to be satisfactory. Quality of the cotton is exceptionally good.

33. A Talk on Cotton Growing in North Nyasa District. (*Nyasaland Agr. Qrtrly. J.*, July, 1941, p. 12.) An instructional paper on cotton cultivation specially written for the people of the North Nyasa District by the Agricultural Supervisor, Karonga, in co-operation with the Protectorate Cotton Officer.

34. Studies on the Physico-Chemical Properties of Associated Black and Red Soils of Nyasaland Protectorate, British Central Africa. By S. P. Raychaudhuri. (*Ind. J. Agr. Sci.*, xi., 1, 1941, p. 100.) A review of the existing literature dealing with the contrasted nature of tropical black and red soils has been made. Physico-chemical properties of two contrasted soil profiles, red and black, occurring in close proximity at Domira Bay in the Nyasaland

Protectorate, have been compared. Clay fractions from the red and black soils have approximately the same SiO_2/Al_2O_3 and $SiO_2/(Al_2O_3+Fe_2O_3)$ ratios. If, however, soil samples are considered from equivalent layers of the profile the red clay seems to possess a somewhat lower ratio than the black. Red clay fractions contain more free iron oxide and free alumina than the black, as given by Turog's treatment. Also the black clay fraction contains more free silica than the red. The percentage of organic carbon of the black soil of Domira Bay was somewhat higher than that of the equivalent layer of red, but not enough to cause the enormous difference in colour of the two soil types. The C/N ratios of the black soils were uniformly higher than those for the red, suggesting that the proportion of protein matter was higher in the red soil than in the black. The organic matter of the black soil appeared to be more readily oxidizable than that of the red. The buffer curves of black soils are more flattened than those of the red, indicating that the former are more active. The black soils have higher moisture equivalents and higher imbibitional moisture capacities than the red soils, although the two soil types have nearly the same clay contents. The black soils are base-saturated to a greater extent than the red ones. The data also show that the black soil contains nearly twice the quantity of exchangeable bases as the red soils.

35. Southern Rhodesia: Cotton Industry, 1940-41. From the report of the Cotton Specialist, Major G. S. Cameron, we learn that weather conditions during the season were unfavourable for cotton, the average yield per acre being 328 lb. compared with 416 lb. in the previous year. Cotton production by natives also declined, since no propaganda drive was undertaken similar to that made in 1939. Against this, however, the demand by natives for seed for planting in 1941 almost trebled that made in 1940.

At the Cotton Breeding Station, Gatooma, the season was not a good one, maize and cotton yields being about 50 per cent. and 66 per cent. respectively of what they were in the previous year. Compost trials again showed significant results when applied to cotton, yielding nearly twice as much when ploughed in as when harrowed in. The new strain 7.L.1 was not available in sufficient quantity to meet the full demand for planting seed, and the strain G.5.123 had to be drawn upon. Four new strains were bulked up to give sufficient seed for variety trials plus a seed reserve of each in case one strain proved outstandingly better than the others. Over 400 single plant selections were made in the field, and 165 were retained after laboratory examination, and are being carried forward into 1942 together with replantings of the 1939 selections. In connection with colchicine treatment of cotton seedlings, progenies of certain strains treated the previous year behaved in an irregular fashion, the reason for which is as yet not understood. A number of these progenies appeared to show improved lint qualities over the parent plants. Plants from thick-leaved parents reverted to normal, while a thickening of the leaves appeared in plants whose parents were normal in this respect. Seedlings from native cottons, which failed to respond to colchicine treatment, were subjected to radiation through acenaphthene crystals, the technique employed being based on that of Kostov (*cf.* Abstr. **534**, Vol. XVI. of this Review). The results obtained were rather striking: bolls became elongated and there seemed a definite lengthening of lint hairs. If these results are carried forward in succeeding progenies, the technique should prove useful to plant breeders.

Comparatively slight injury to cotton was caused by pests and diseases during the season. Sudan and Spiny bollworm were fairly plentiful, and termites did sufficient damage to warrant their inclusion among the major pests of cotton. There was very little angular leafspot and no evidence of blackarm.

Ginning operations were transferred from Bindura to Gatooma. This caused some delay, and ginning commenced on September 23 and was completed by November 17.

Prospects for the 1941-42 *Season.*—The Government's decision to guarantee prices for locally grown cotton over a period of five years has had an immediate response from growers, and the demand for planting seed indicates a three- to four-fold increase in acreage. The establishment of an Absorbent Cotton Factory and Spinning Mills at Gatooma will enable a large proportion of the local cotton crop to be processed in the country, but additional machinery will be required to cope with any further extension of production.

36. SOUTH AFRICA: COTTON INDUSTRY, 1940-41. (*Farmg. in S. Afr.*, December, 1941, p. 412.) The cotton crop is expected to be about the same as in the previous season—namely, 1,650 bales of 500 lb. Although this figure is much better than those of the past few seasons, it does not testify to any important development in the cotton industry. What is of particular importance to cotton producers, however, is the fact that the war has not only brought about an improvement in cotton prices, but it has also made them less dependent upon the oversea market. This is clearly evidenced by the fact that up to the present about half of the crop has been disposed of for processing in the Union itself. To what extent this is merely a temporary development due to the war is difficult to say at this stage, but strong attempts are being made to erect a cotton-spinning factory in the Union, and if this scheme materializes it may serve as a fresh incentive to cotton production in South Africa.

37. COTTON PLANT: DEVELOPMENT AND YIELDS UNDER IRRIGATION IN THE SUDAN. By F. Crowther. (*Ann. Bot.*, 5, 1941, p. 509. From *Summ. Curr. Lit.*, xxi., 21, 1941, p. 514.) Observations on the development and yields of cotton plants carried out over a period of thirteen years in an observation plot at the Gezira Research Farm are discussed. Significant correlation was found between the leaf nitrogen (as percentage of dry weight) within two weeks of sowing and the final yield four to seven months later. In years in which leaf nitrogen was high shortly after germination the crop grew vigorously and was both taller and produced a total dry weight greater than normal. Flower numbers were also high in these years of vigorous growth. Defoliation, measured by the number of leaves shed from the main stem, proved to be more highly correlated with yield than all the other growth characteristics observed. Heavy leaf shedding three to four months after sowing was regularly followed by low yields; where the lower leaves persisted longer than usual yields were correspondingly higher. Apparently defoliation is an index not only of crop size, a vigorous crop maturing later than one of stunted growth, but also of any subsequent damage to leaves. In the experiment blackarm disease was frequently severe and was responsible for part of the defoliation. The experiment provides critical information on the causes of seasonal yield fluctuation. Although both blackarm and leaf curl were severe in years of low yield, the data collected early in the season proved growth to be inferior before the disease had become widespread. It is concluded that a "soil factor," with which the amount of nitrogen available for the crop is closely associated, is primarily responsible for the major yield fluctuations and that the rôle of both blackarm and leaf curl is secondary. The yields of the experiment from season to season correspond fairly closely to those of the surrounding commercial area, if allowance is made for a progressive improvement in the soil fertility of the experimental area resulting from crop and fertilizer residues. Equations are given for forecasting the yield of the experiment at monthly intervals from shortly after sowing onwards.

38. Production in the Uganda Protectorate. (*Crown Colonist*, February, 1942, p. 76.) The main industry of the country has for years been the production of cotton. This is grown entirely by native cultivators, and marketed under Government supervision to buyers who gin and export it. The quality of the crop is good, and it commands a substantial premium over American Middling. Very little of the cotton has been shipped to England since 1939, and India, which requires this particular type, has taken the bulk of the cotton. The acreage under cultivation has steadily increased during recent years, and some 368,000 bales were produced in the 1940-41 season. The present policy is to increase production by better cultivation rather than by increased acreage. Of recent years there has been a considerable demand from overseas for cotton seed for crushing purposes, but shipping difficulties since the outbreak of war have put a stop to overseas export.

39. Uganda: Cotton Prospects, 1941-42. The report from the Dept. of Agriculture dated December last states that "continued heavy rains well above normal have seriously damaged early planted cotton, but later sowings have benefited and will give good yields provided the weather follows its normal course and drier conditions prevail from now on. Blackarm disease is more prevalent than last season, and is causing damage in several districts. The condition of the crop at the time of writing would appear to warrant an estimate of approximately 365,000 bales."

40. Cotton Industry, 1941-42. (*Crown Col.*, March, 1942, p. 172.) The cotton season opened in the Eastern and Northern provinces on January 19. Prices at the beginning ranged from Sh. 9.50 per 100 lb. seed cotton to the native grower in Busoga district to Sh. 7 in Lango district, but on the second day dropped 50 cents all round owing to weakness in the l nt market. Lint was quoted at 44 cents. per lb. best quality, Kampala, but improved later to 46 cents. Buying was slower than usual owing to damage to cotton by unseasonal rains late last year, and to Government and ginners insisting on picking over, which resulted in the grade being up to standard.

41. AUSTRALASIA. Queensland: Cotton Industry, 1939-41. (*Ann. Rpts. Dpt. Agr. and Stock.*, 1939-40 and 1940-41, recently received.) *Cotton* 1939-40.—Seasonal conditions generally were unsatisfactory for cotton, and a combination of fiscal uncertainty and the lateness of planting rains caused a steep decline in production. With the renewal of the bounty on raw cotton and the rapid expansion of the home market an intensive campaign to stimulate production was made, and a greatly increased acreage was expected for 1940-41. Growing cotton under supplementary irrigation was investigated during the year, the results being in favour of irrigation where it can be practised economically. Further progress was made in the development of superior strains of cotton suited to the requirements of Australian spinners, the outstanding varietal performance being that of Oklahoma Triumph. In breeding experiments in the South Burnett district successful progress was made with New Mexico Acala, which may eventually become the leading staple cotton. Satisfactory progress was also made with the hybridization project between the jassid resistant U.4 variety and Miller, the cotton most extensively grown in Queensland. Damage by insect pests was not so severe as in some years, the chief pests being locusts, rough bollworm, corn earworm, cotton loopers, and jassid.

Cotton, 1940-41.—Weather conditions were generally unfavourable for cotton, but in spite of this yields showed a substantial increase. In view of the wartime importance of the crop much attention was devoted to problems in plant breeding, entomology, soils, irrigation, and plant physiology connected with cotton. The quick-maturing Oklahoma Triumph variety was again outstanding, and other

promising strains were New Boykin and Lone Star. Work was continued with some measure of success in the breeding blocks of Farm Relief, New Mexico, Acala, Stoneville, Qualla, and Half-and-Half, but as yet no strains of outstanding merit have been evolved. Several thousand acres of an improved strain of Miller are expected to be planted next cotton season. Cotton pests were fairly active during the season, the most important being corn earworm, cotton looper, pink bollworm, and jassid.

42. Fiji: Cotton Experiments, 1940-41. (*Agr. Jour. Fiji*, **12**, 4, 1941, p. 115.) Upland (short staple) varieties of cotton from Queensland have been under trial to compare returns with those from Sea Island (long staple) cotton as hitherto grown in Fiji. Yields of over 1,000 lb. per acre were obtained on trial plots. Investigations are not yet completed.

43. WEST INDIES: Sea Island Cotton Crop, 1941. (*W. Ind. Comm. Circ.*, 30/10/41, p. 264.) The total acreage planted was 19,030 acres, and the yield amounted to 3,083,500 lb. of clean lint. "Superfine" strains are grown in St. Vincent (V. 135), Barbados (S. 27 [6]) and St. Lucia (V. 135). An "ordinary" strain (M.S.I.) is grown in all the other islands.

44. Barbados: Cotton Industry, 1939-40. (*Ann. Rpt. Dpt. Sci. and Agr.*, 1939-40.) 120 acres were planted to cotton; growth on the whole was good and yields of seed cotton better than for some years past. Progeny row and bulking plots were grown during the season and the seed from these will provide commercial planting material for the 1941-42 crop. During the period under review no pink bollworm was found in the field or at the ginnery. The cotton leafworm (*Alabama argillacea*) appeared at the usual time, but was kept in check by dusting and spraying. To secure the introduction of only healthy material into the island the holds of fifteen ships were fumigated with "Zyklon B" and 9,613 bags of imported cotton seed were disinfected by means of the Simon's Heater.

45. Increased Cotton Planting, 1940-41. (*W. Ind. Comm. Circ.*, 25/12/41, p. 314.) The close season in Barbados ended on August 31. Seed distribution started on August 27, and, partly on account of favourable rains on that night, requests for seed were larger than had been expected. By the end of the month seed had been issued for approximately 1,200 acres, divided between plantations and peasants in the ratio of approximately one to three respectively. This acreage was already largely in excess of that for many years past.

46. Grenada: Cotton Export Regulation. (*W. Ind. Comm. Circ.*, 13/11/41, p. 279.) Official notice has been given that, as from January 1, 1942, and until further notice, exports of Marie Galante cotton will not be permitted to exceed 2,100 cwt. annually. No shipper will be granted licence to ship more than the quantity exported by him in 1940.

COTTON IN THE UNITED STATES.

47. Cotton Quality Statistics, United States, 1939-40. (*U.S. Dpt. Agr., Agr. Market. Serv.*, 1940. From *Exp. Sta. Rec.*, **85**, 5, 1941, p. 684.) Continues the series on grade, staple length, and tenderability of cotton. Figures are included for the first time on the grade and staple length of the supply (carry-over plus crop) and the disappearance of Upland cotton.

[*Cf.* Abstr. **219**, Vol. XVI. of this Review.]

48. American Cotton Handbook. By G. R. Merrill *et al.* (Amer. Cott. Handbook Co., New York. Price: U.S. and Canada, $4.80; other countries,

$6.00. From *Text. Manufr.*, January, 1942, p. 25.) The book covers information on the historic, economic, social, technical, and chemical phases of cotton growing and manufacturing in the United States.

49. Cotton Price Relationships and Outlets for American Cotton. By L. D. Howell. (*U.S. Dpt. Agr., Tech. Bull.* 755, 1941. From *Exp. Sta. Rec.*, **85**, 6, 1941, p. 834). The relation of cotton prices to the supply and demand, price differences for quality and location, the relations of changes in prices of American cotton to other growths, and of price ratios to supply ratios and consumption ratios are analyzed and discussed.

50. Sea Island Cotton Research Efforts. (*Cotton*, M/c., 7/3/42.) An instance of peace-time research given in a recent report of the U.S. Bureau of Plant Industry is the work of the Bureau in developing extra long staple cottons. Sea Island cotton has the longest and strongest fibres of any type, and has been used in the manufacture of balloons and parachute cloths, gas cells for dirigibles, and airplane wing coverings. New strains of Sea Island coming into production in 1942 have even longer and finer fibre, which makes them more useful in meeting war needs. The S×P variety of American-Egyptian cotton developed by the Bureau, and now in large-scale production in the south-west, is being used for making balloon cloth and inflatable pontoons for seaplanes.

51. American-Egyptian Cotton in the U.S.A. (*Cotton*, M/c, 17/1/42, p. 6, and 7/2/42, p. 5.) The recent sharp increase in the acreage and production of American-Egyptian cotton has been mainly due to (1) the reduced production of Sea Island—the only other extra-long staple cotton grown in America—from 118,000 running bales in 1916 to 7,000 bales in 1919, largely because of boll-weevil damage; (2) increased difficulties in obtaining suitable supplies of Egyptian cotton; and (3) heavy demand for extra-long staple cotton for making strong and durable fabrics for airplane wings, balloons, automobile tyres, and for many other military and civilian uses. Prices advanced sharply, and the acreage of American-Egyptian cotton was greatly increased.

Consumption in the 1940-41 season totalled nearly 27,000 running bales, the highest since 1923-24. The indicated production for the 1941-42 season is estimated at 72,000 bales of 500 lb. each (equivalent to about 70,000 running bales), and the carry-over on August 1 last at nearly 16,000 bales, giving a total supply of about 86,000 bales for the season.

52. Sun Spots and Magnetic Storms: Effects on American Textile Industry. By P. M. Strang. (*Text. Res.*, **11**, 1941, p. 447. From *Summ. Curr. Lit.*, xxi., **22**, 1941, p. 559.) During the spring months of 1938 and 1940 New England cotton mills had trouble in maintaining both the quality and production of their goods. Declines in yarn quality were observed even in cases where the same mixing of cotton had been spinning satisfactorily and the same equipment producing satisfactory results for a considerable time. Manufacturers in the south also commented on a falling off in yarn strength and the fuzzy appearance of the yarns, but in general their difficulties were not as great as those in the Northern States. Rayon and wool manufacturers were also having trouble. At the same time the telephone, telegraph, and power companies were experiencing unusual difficulties in the operation of their systems as a result of magnetic storms caused by sun spots. A study of the distribution of these disturbances and of the textile industry shows that the industry is located in sections where the atmosphere is susceptible to electrical disturbances which vary in intensity from a minimum at the equator to a maximum near the Canadian border, and largely in sections of high earth resistivity. The experience of manufacturers during the magnetic storm of 1940 is discussed, and mention is made of one mill which had to shut down some of its processes one morning

because of static electrification. It is pointed out that the entire European textile industry, including that of Great Britain, is outside the field of maximum intensity of the magnetic storms, and it is suggested that this may account in some measure for differences between results obtained there and in America. There are indications that sun spots merely accentuate an atmospheric condition which normally affects textile manufacturing to a much smaller degree. Seasonal variations in static electricity have been observed by manufacturers. Daily and annual cycles in the amount of ionization of the air have been recorded, and it is suggested that these are related to cycles in manufacturing processes. A similarity is observed between curves showing the daily ionization cycle and the daily change in end breakage in spinning. A curve showing daily variation in loom stops also has a similar form. The amounts of ionization vary with latitude, altitude, and other conditions. The need for further research on the effects of ionization and sun spots is pointed out, and it is suggested that they may affect cotton fibres during their growth. It is also pointed out that results of textile research obtained in one region may not at once be applicable in other regions.

53. Alabama: Agronomic Research in 1939. (*Alabama Sta. Rpt.*, 1939. From *Exp. Sta. Rec.*, **85**, 4, 1941, p. 470.) The work on cotton included breeding experiments; variety tests; the response of cotton to Mg and rare elements in South Alabama; top dressing cotton with potash; influence of soil moisture and fertilizer applications on the oil and protein content of cotton seed.

54. Field Crops Research in Arizona. (*Ariz. Sta. Rpt.*, 1940. From *Exp. Sta. Rec.*, **85**, 5, 1941, p. 608.) The work with cotton included varietal and breeding tests, and experiments concerned with irrigation needs, heat resistance, and lint strength of cotton.

55. Louisiana: Cotton Plantation Labourers: A Socio-economic Study of Labourers on Cotton Plantations in Concordia Parish. By S. E. Grigsby and H. Hoffsommer. (*La. Sta. Bull.* 328, 1941. From *Exp. Sta. Rec.*, **85**, 2, 1941, p. 266.) A study of the social and economic conditions of negro farm labourers in a typical cotton-growing parish. The total average annual cash income for negro males from all sources, including the earnings of dependents, was $175. One-half earned $150 or less, a third from $150 to $200, and the remainder (15 per cent.) upwards of $250. The greater proportion of the labourers had an income of less then $150 from agriculture. The median income from this source was $81. No relationship appears to exist between the size of income and education.

56. Louisiana: U.S. Southern Regional Research Laboratory: Activities. By W. M. Scott. (*Amer. Dyes. Rpt.*, **30**, 1941, pp. 604, 619. From *Summ. Curr. Lit.*, xxii., **2**, 1942, p. 55.) An account is given of the proposed organization of research in the Cotton Chemical Finishing Division of the Southern Regional Research Laboratory established at New Orleans by the U.S. Dept. of Agriculture. Some of the properties of cotton that will receive attention are listed, and mention is made of the fields in which each property is particularly important. The chemical finishing research is being organized in two sections: (1) an additive finishing section for the study of treatments depending on the addition of chemical compounds to the cotton, and (2) a modified finishing section for the study of treatments in which the surface characteristics of the cotton are altered by the action of chemical agents. Consideration will be given to the effects of the various compounds and agents on cotton properties, and to the development of new compounds and agents and new methods of application. A list is given of some of the items of textile testing equipment which will be used for the evaluation of finishing treatments. The Laboratory is being equipped to demonstrate

on a pilot-plant-scale the commercial practicability of each successful laboratory development. Practical trials on a full commercial scale will be carried out by manufacturers and finishers who have indicated their willingness to co-operate. It is planned to use every suitable means to acquaint consumers with the merits of new developments in cotton textiles, and to this end a co-operative agreement has been effected with the U.S. Bureau of Home Economics.

57. MISSISSIPPI: CHEMICAL DUST DISINFECTANTS INCREASE STANDS, YIELDS, AND MONEY RETURNS FROM COTTON, IN TESTS CONDUCTED FOR TWELVE YEARS. By L. E. Miles. (*Miss. Farm. Res.*, **4**, 5, 1941, p. 2. From *Exp. Sta. Rec*,. **85**, 4, 1941, p. 493.) Tests in Mississippi over a twelve-year period are reported to have shown that cottonseed treatment with certain disinfectants prior to planting will prevent losses due to poor stands and will yield high returns in profit for the small amount invested. Ethyl mercury chloride and ethyl mercury phosphate (Ceresan and New Improved Ceresan respectively) gave best results among the dusts tested.

58. NEW MEXICO: NATIVE COTTON CULTIVATION. By L. A. White. (*Sci.*, **94**, 1941, p. 162. From *J. Text. Inst.*, xxxii., **11**, 1941, A497.) The cultivation of cotton by Indian pueblos in the Rio Grande Valley has been traced back beyond 1540, but has long since been discontinued except for ritual purposes. A specimen collected in 1936 is identified as closely related to *Gossypium hopi*, though it bears some resemblance to *G. hirsutum*. The strain appears to be a relic of aboriginal agriculture.

59. NORTH CAROLINA: FIELD CROPS RESEARCH, 1939-40. (*N. Car. Sta. Bien. Rpt.*, 1939-40. From *Exp. Sta. Rec.*, **86**, 1, 1942, p. 33.) Work on cotton included varietal trials; breeding better cotton by changing the number of chromosomes; fertilizer experiments; cotton fibre research dealing with relation of arrangement of cellulose within the fibre to strength of fibre and its modification by environment, growing conditions, and relation of variety and season to fibre and yarn properties; effect on stands of treating cotton seed with organic mercury dusts.

60. OKLAHOMA: COTTON VARIETY TESTS CONDUCTED AT LAWTON IN 1940. By H. E. Dunlavy *et al.* (*Oklahoma Sta. Circ.* 93, 1941. From *Exp. Sta. Rec.*, **85**, 4, 1941, p. 474.) The 14 high-yielding cottons among the 55 varieties and strains tested at the U.S. Dry Land Field Station in 1940 represented the Acala 5, Deltapine, Stoneville, Lone Star, Triumph, Rowden, and Hi-Bred families or lines. These 14 varieties averaged 160 and 106 lb. more seed cotton and of seed per acre respectively, and returned $4.68 more per acre for lint than did the other 41 varieties. The 55 varieties produced an average of 516 lb. of seed per acre, estimated to contain about the same amount of protein as 22 bu. of corn or 14 bu. of wheat. The 14 varieties averaged slightly over 15/16 inch, ranging from 13/16 to 1 inch in staple length, while the other 41 varieties averaged slightly over 31/32 inch and 15 of the 41 stapled longer than 1 inch. The average cost of picking and ginning a bale for the 55 varieties was $13.55, and for pulling and ginning $14.14. Data on these and other agronomic characters and factors are tabulated and discussed.

61. COTTON BURS AS FERTILIZER. By H. Freudenberger. (*Acco Press*, **19**, 10, 1941, p. 20. From *Cott. Lit.*, December, 1941, p. 491.) Yield increases averaging 189 lb. seed cotton per acre were obtained at the Oklahoma Agricultural Experiment Station by fertilizing Upland cotton with 3 tons of cotton burs to the acre.

62. SOUTH CAROLINA: LESPEDEZA INCREASES COTTON YIELDS. By A. B. Bryan. (*Prog. Farmer*, **56**, 3, 1941, p. 33. From *Cott. Lit.*, June, 1941, p. 219.) Results

of tests at the Experiment Station indicate that cotton following lespedeza yielded 939 lb. per acre as compared with 538 lb. where cotton followed cotton.

63. Tennessee: Cotton Storage. By G. E. Allred and B. D. Raskopf. (*Tenn. Sta., Agr. Econ. and Rural Sociol. Dept. Monog.* 127, 1941. From *Exp. Sta. Rec.*, **85**, 5, 1941, p. 684.) Discusses the location, capacity, functions of warehouses; storage and compression charges; distribution, trend, and length of storage; reasons why farmers store or do not store cotton, etc.

64. Cottonseed Treatments in Tennessee. By N. I. Hancock and D. M. Simpson. (*Tennessee Sta. Bull.* 175, 1941. From *Exp. Sta. Rec.*, **85**, 2, 1941, p. 210.) Seedling diseases are said to be specially troublesome in Tennessee, where adverse growing conditions are common at planting time. Organic mercury dusts have proved to be inexpensive insurance against such troubles, New Improved Ceresan (1½ oz. per bushel of seed) being recommended, but with care in handling and in keeping away from livestock. Seeds delinted either mechanically or by acid are planted more evenly and germinate more quickly under low temperature and soil moisture. Dry seeds untreated or treated with Ceresan can be stored profitably for future use.

65. Texas: Winter Legumes as Soil Improving Crops for Cotton. By E. B. Reynolds *et al.* (*53rd Ann. Rpt. Texas Agr. Exp. Sta.*, 1940, p. 62.) Successful results were obtained with the ploughing in of hairy vetch as a soil-improving crop preceding cotton. Some of the vetch plats were fertilized with 400-500 lb. of 0-8-4 per acre, and others received nothing. Results obtained on the sandy soils at College Station, Nacogdoches, and Tyler showed definitely that the ploughing under of vetch furnishes an abundance of nitrogen for cotton following, that the application of 100-200 lb. superphosphate per acre is necessary to secure the full benefit of the vetch, and that these treatments have increased the average yields of cotton 40-65 per cent.

66. Puerto Rico: A New Cotton Strain. (*W. Ind. Comm. Circ.*, 13/11/41, p. 271.) A new strain of Sea Island cotton was further tested in the 1939-40 season. The year's crop showed a lint length of 2 in., 29 per cent. lint, and a lint-index of 3·82. On 23 acres planted at Lafayette the yield was nearly 1,300 lb. seed cotton per acre.

67. El Cultivo del Algodón en la Costa Noroeste en 1939 fué Lucrativo. By L. M. Géigel. (*Rpt. No.* 16 *of P.R. Agr. Exp. Sta.*, mimeographed. From *Cott. Lit.*, June, 1941, p. 226.) Gives the costs and returns in producing Sea Island cotton on the north-east coast of Puerto Rico in 1939.

COTTON IN EGYPT.

68. Egypt: Cotton Acreage Restricted. (*Cotton*, M/c., 31/1/42, p. 1.) Both Chambers of the legislature have finally approved a Bill restricting cotton acreage to 22 per cent. of the cultivated area in the Northern Delta and 15 per cent. in the remainder of the country, instead of 27 per cent. and 23 per cent. respectively as provided in earlier legislation. Cotton-growing is also prohibited in all basin land, while no land is to remain fallow this year. These measures are expected to make good the deficiency of cereals.

69. Cotton in Egypt. By J. A. Todd. (*Text. Mnfr.*, lxviii., **806**, 1942, p. 68.) "The Egyptian Government's decree, prohibiting the planting of cotton in 1942 in all basin lands of Upper Egypt and in two provinces and part of another in Lower Egypt, and restricting cotton plantings elsewhere to 23 per cent. of the total land under cultivation, is expected to result in a reduction in the total

planted acreage this year to 1,110,000 feddans. This compares with an average in pre-war years of 1,700,000 feddans. Production in 1942 may therefore be curtailed to between 5,500,000 and 6,000,000 kantars, as against a pre-war normal of around 9,000,000 kantars. It is probable that growers, in view of the large accumulated stock of short staples from the 1940 and 1941 crops, will plant Giza 7 and other long-stapled cottons more freely this year. The Egyptian Government has been influenced to take this drastic action in reducing cotton production by the serious congestion of unsold surpluses from previous crops and by the imperative need for Egypt to grow more foodstuffs to make good the deficiency of imports and provide for steadily increasing military requirements."

70. Egyptian Cotton: New Varieties. (*Cotton*, M/c., 14/3/42.) Growers of the new Egyptian cotton Karnak—formerly known as Giza 29—have again reported a successful year, and a further marked expansion of acreage under this variety is expected this season. Present indications are for still further expansion to a dominating position in the Delta in 1943. Karnak is reported to have an appreciably better spinning value than Giza 7. The present longest-staple Egyptian variety, Malaki—formerly known as Giza 26—which is also slowly increasing in acreage, has not yet become freely available for ordinary commercial purposes.

COTTON IN OTHER FOREIGN COUNTRIES.

71. Argentina: Manufacture of Cotton Bags from Surplus Cotton. (*Cotton*, M/c., 7/3/42.) A United States Dept. of Agriculture report states that owing to growing difficulties in finding export markets for surplus cotton, the existing shortage of jute bags, and the needs of industries requiring bags in their operations, the Government of Argentina has authorized the allocation of 10,000,000 pesos ($3,000,000) for the construction of a National Cotton Sack Factory to make bags from surplus cotton. The factory will have an estimated production capacity of 30,000,000 sacks a year, or sufficient to supply the 20,000,000 to 23,000,000 bags used annually by the flour and meal industries, leaving some 7,000,000 to 8,000,000 bags for other uses. It will be difficult to have the plant in operation before 1943 because of delays in securing machinery from America. The construction and initial management of the factory will be under the supervision of the Argentine Cotton Board, who have for several years advocated the use of low-grade cotton from the Chaco for making cotton bags. It is expected that the factory will aid colonization in the Chaco and Formosa territories in northern Argentina.

72. Brazil: Cotton Linters. (*Cotton*, M/c., 1/11/41, p. 6.) The production of cotton linters in the State of São Paulo during 1941 is estimated at 68,000 metric tons, compared with only 16,000 tons in 1936, and it is expected that exports will reach 60,000 tons valued at 70,000 contos. Brazil may thus supersede India as the largest world-exporting country for this product. There is at present a large demand from America for first-cut linters which are used in the manufacture of explosives and artificial silk. The local price of linters is now only slightly below that of type 7 cotton, the reason being that first-cut linters may be imported into the U.S.A., whereas ginned cotton is excluded by quota.

73. Cotton Productivity in the State of São Paulo. (*Bull. Chamb. Comm., S. Paulo*, No. 24, 1939. From *Pl. Bre. Abs.*, xii., 1, 1942, p. 58.) The paper refers to experiments with selected U.4 cottons from South Africa which gave greatly increased yields in comparison with the types of Upland generally grown in the State of São Paulo. The opinion is given that these types of U.4 are

likely to solve the problem of poor productivity in certain districts where the Express-Texas varieties have been previously grown.

74. CHINA: THE NATIONAL AGRICULTURAL RESEARCH BUREAU, CHUNGKING. RPT. FOR THE YEAR 1938. (*Misc. Pubn.*, No. 8, Chungking, December, 1939, received 1942.) Gives the history of the National Agricultural Research Bureau and its journey to West China. Since the war, China's cotton belt has gradually fallen into the hands of the Japanese, and shortage of raw cotton is a growing threat. To meet the situation new fields of cultivation are being explored, of which Szechwan shows the greatest promise, with Yunnan ranking second. Experiments with new varieties and better cultural methods are being carried out: the best results were obtained with the American Delfos cotton. The tree cotton of Yunnan has a lint length of $1\frac{1}{4}$ to $1\frac{1}{2}$ in.; it is strong in tensile strength, and yields more than 42 skeins of yarn per pound of cotton. These tree cottons are of high quality, high yield, resistant to insect pests and diseases, and easy of cultivation.

75. ECUADOR: COTTON CROP, 1941. (*Cotton*, M/c., 22/11/41, p. 6.) The crop is now expected to reach 11,700 bales, despite adverse weather conditions in the early part of the current season. According to advices to the U.S. Office of Foreign Agricultural Relations, last year's production of some 9,200 bales was not quite sufficient for domestic mill requirements and small quantities were imported from Peru. Ecuador's soil and climatic conditions are said to be generally suitable for cotton growing, and a considerable expansion of acreage may be possible. The chief detriment to the industry in the past has been the inability of farmers to obtain sufficient credit to expand, and a recent campaign, by the press and cotton planters, to remedy this situation is expected to bring results when planting begins in 1942.

76. EL ALGODON MEXICANO: SUS NECESIDADES DE EXPORTACION. (*Rev. de Econ.*, 4, 9, Mexico, 1941, p. 29. From *Cott. Lit.*, January, 1942, p. 12.) A discussion of Mexico's position as an exporter of cotton, setting forth the acreage cultivated, population engaged in the industry, production, domestic consumption, exports, the quota assigned by the U.S. to Mexico, the place of cotton among the country's agricultural exports, and the balance of trade between Mexico and the United States. Reasons are given why Mexico should not reduce her cotton areas, and why the United States' quota for Mexican cotton is too small.

77. PERU: RÉGIMEN DE EXPLOTACIÓN DE LOS FUNDOS ALGODONEROS. By B. V. Nanez. (*Com. Admin. del Guano. Boletin*, 17, 6, 1941, p. 243. From *Cott. Lit.*, October, 1941, p. 400.) Describes the cultivation of cotton in the eighteen cotton valleys of the coastal region of Peru by the owners, by tenants, or by the "yanaconas" or Indians to whom the land is turned over in small plots, and who are responsible to the owner or his representative. The reasons for the prevalence of one or the other systems in the different districts are given, and their advantages and disadvantages discussed.

78. RUSSIA: THE COTTON RESEARCH INSTITUTES IN THE THIRD FIVE-YEAR PLAN. By A. Gorcakov. (*Sovetskii Khlopok*, **11/12**, 1939, p. 17. From *Pl. Bre. Absts.*, xi., 4, 1941, p. 308.) Certain criticisms of the work of the experiment stations in the past are offered, with indications of many possible lines of improvement.

79. THE EGYPTIAN COTTON VARIETY 213 (IN U.S.S.R.). By K. Tsinda. (*Sovetskii Khlopok*, 3, 1940, p. 35. From *Pl. Bre. Absts.*, xi., 4, 1941, p. 304.) The variety was produced in 1931 by individual plant selection from the variety Janovic. It is 7-8 days earlier than Maarad and yields 44 per cent. more cotton before the onset of the frosts than Pima and Maarad; this is a great

advantage, since such cotton is of a higher quality than that produced later. Its average yield of seed cotton in the six years 1934-39 was 16·4 per cent. higher than that of Maarad. Its yields have been much higher than Maarad in tests on collective farms, the difference in seed cotton varying from 0·5 to 14 c. per ha. and in lint from 0·3 to 5·6 c. per ha. In two cases its yields have been the same as Maarad, but it was never inferior. The variety is distinguished by bolls above the average in size, equal to or somewhat larger than Maarad, many having four locks and occasionally five. The ginning percentage was 29-31 as against 29-30 per cent. in Maarad. The 1,000 seed weight was 130-140 grm., the seeds being almost naked. The plant is some 10-30 cm. less than Maarad in height and is less spreading in habit. The stems are strong and pigmented. Monopodial branches are few or absent; there are many subsidiary sympodia and two bolls are frequently borne in one axil and the yield is therefore reliable. The lint length varies from 37 to 40 mm., with an average of 37-39; the lint is thin (metric number 7200-7900) and strong. In quality of both lint and fabric the new variety is regarded as superior to Maarad.

80. Long-Stapled Varieties of Egyptian Cotton in the Azerbaijan S.S.R. By A. Inozemtsev. (*Sovetskii Khlopok*, **9**, 1939, p. 28. From *Pl. Bre. Absts.*, xi., **4**, 1941, p. 305.) New varieties of Egyptian cotton distinguished by greater earliness, productivity, and length of lint have been produced. The best are D-96 and 3408-I, which are 22-23 days earlier than the variety hitherto grown and have a lint length of 46-48 mm. They exceed the previous variety by 45-52 per cent. in yield of seed cotton and by 18-27 per cent. in lint yield; 89-91 per cent. of their yield is collected before the frosts.

81. New Varieties of Soviet Long-Linted Cotton in Turkmenistan. By V. Kulebjaev. (*Sovetskii Khlopok*, **11-12**, 1940, p. 34. From *Pl. Bre. Absts.*, xi., **4**, 1941, p. 304.) From 1931-39 the Turkmenistan Cotton and Lucerne Experiment Station has produced the following promising, relatively high-yielding and high-quality varieties of cotton of the Egyptian type with long lint: Nos. 2963 I, 348 II, 3169 I, 283 I 2, 1076 I, 151-2 I, and 910 I. Particulars are given of their origin and their characteristics and performance in various trials and in spinning tests. In 1933, in order to obtain a cotton plant of compact habit for mechanized harvesting, some hybridization experiments were begun by the author with two selections from Ashmouni-0670—namely, 283 I2 (used as the female parent) and 1076 I (as the pollinator)—and these selections were characterized by earliness and short sympodia and internodes. Nine combinations were made. In the third generation family No. 101 from one combination segregated for four types of branching; and strain No. 3169 I was selected for multiplication as a line with the determinate branching habit, though some segregation was found to be still occurring in the F_4. Strain 151-2 I is another early variety in which plants without monopodia frequently occur. Economic conditions in the U.S.S.R. have created a demand for cottons with coarser lints, but of good quality, for admixture with wool in manufacture or for use as a substitute. In these types high yield, large bolls, and disease resistance must also be combined. Some large-bolled types with coarse lint have been bred from lines of *Gossypium barbadense* crossed by *G. peruvianum*, the final selections of this cross being lines Nos. 4844 I and 4848 I. Another line, No. 4842 I, derived from hybridization of the same two species, has a more compact habit than the two foregoing lines. These interspecific crosses are said to be also producing some quite new forms which may possibly be of economic value.

82. Production of Early Maturing Sea Island Cotton (U.S.S.R.). By A. V. Bereznjakovskaja. (*Jarovizacija*, 1 (34), 1941, p. 40. From *Pl. Bre.*

Absts., xii., **1**, 1942, p. 58.) Sea Island plants were grown under cover, but were subjected to low temperatures during the first stage of phasic development. The first generation progeny contained various anomalous forms, including some dwarfs which ripened very early, before the beginning of the frosts. These plants also had bolls which opened wide as in Upland cotton. Variation occurred in the entire population in respect of time of maturity. The 51 best plants were selected and their progenies were studied separately. Variation was again observed in time of maturity, some lines being up to 29, and odd ones even 35-40 days earlier than the control. The progeny of the dwarf plants were normal in habit and typical Sea Island plants, but were the earliest of all in maturity, some of them ripening 29 days before the control; when sown in the open on April 20 they ripened in 130-140 days. The treatment was applied again to some of these second generation plants; the progeny proved distinctly hardier than untreated plants, earlier in flowering by 1-19 days, and in ripening by 2-3 weeks. In ripening they were simultaneous with the Egyptian cottons. As regards other characters, including the quality of the lint, the plants were indistinguishable from ordinary Sea Island.

83. Russia: Replace the Cotton Variety 1306 by Better Varieties. By P. Gattenberger. (*Sovetskii Khlopok,* **9**, 1939, p. 28. From *Pl. Bre. Absts.*, xi., **4**, 1941, p. 305.) The variety 1306 is the earliest cotton grown and has enabled cotton cultivation to be extended northwards as far as latitude 50° N. Its lint, however, is exceedingly short, in poor years not exceeding 25 mm. In 1937 and 1938 certain new varieties were released which are about equal to 1306 in earliness, but distinctly superior in lint quality, size of boll, and many other features, including yield. The history of the variety 1306 and a number of variants of it is outlined, and there follow descriptions of the new improved types referred to. 1375 I, a selection from a local mixture, is 2-3 days earlier than 1306, its bolls are of medium size, the seed cotton per boll weighing 4 grm.; its ginning outturn is 32·0 per cent., which is 1 per cent. higher than in 1306; the lint is 27-28 mm.—*i.e.*, 1 mm. longer than that of 1306; the cotton does not shed from the ripe bolls. The quality of the lint of this cotton from unirrigated land was classed higher than any other, but it is somewhat more prone to gummosis than the other varieties. The 803, a selection from Karajaz-King, is very high in yield, bears large bolls giving 5-5.5 grm. seed cotton, has a ginning outturn of 34-35 per cent. and lint length of 28/29 mm.; the lint does not shed. This strain is 1-2 days later than 1306 in maturity, but is free from gummosis and quite suitable for replacing 1306 in certain areas. Variety OD 1, a selection from the F_4 of a cross between varieties 915 and 1306, has exceeded 1306 in yield, equals it in earliness and has large bolls yielding 4·5-5·0 grm. of seed cotton; it is free from shedding, the ginning outturn is 34-35 per cent. and lint length 27/28 mm.; it is less susceptible to gummosis than 1306. Variety 14958-4 is 3-4 days earlier than 1306, which it exceeds also in ginning outturn (34-35 per cent.); it is less prone to shedding and the bolls are somewhat bigger. This cotton is recommended for the most northerly districts of all; its lint, however, is 1·5-2·0 mm. shorter than that of 1306. Variety C 925, a product of individual plant selection from a mixture of Kirda, equals 1306 in earliness, produces 5 grm. seed cotton per boll, with a ginning outturn of 34-35 per cent., and lint length 29/30 mm.; it outyields 1306 by 6-35 per cent. The lint is pronounced to be of good spinning quality, being 2 mm. longer than 1306 and somewhat stronger.

84. Russia: New Coarse-Linted Forms of Cotton. By V. Kulebjaev. (*Sovetskii Khlopok,* **6**, 1939, p. 46. From *Pl. Bre. Absts.*, xi., **4**, 1941, p. 306.) With the object of producing large-bolled cottons yielding coarse lint, but capable

of being used as a wool substitute, crosses were made between Egyptian cottons (*Gossypium barbadense*) and perennial Peruvian cottons (*G. peruvianum*), which were induced to flower by treatment with a 10-hour day. The F_1 plants behaved as perennials, giving seed only when grown under curtailed illumination. The F_2 generation segregated into annuals and perennials and showed great variations in fertility, lint length and other characters. Segregation was also observed in the F_3 generation. Several plants of the annual, Egyptian type of habit, with coarse, woolly lint were selected; they were later than Pima in maturity. These plants are described; the first has white, woolly, strong lint 34-36 mm., base 45·4 per cent., uniformity 1498, strength 6·7 grm., and metric number 4343; the second has creamy, woolly, strong lint, 35-37 mm., base 41·7 per cent., strength 6·6 grm., metric number 5350. Some of the hybrids have bolls weighing 5-7 grm., and their lint is considered quite suitable for mixing with wool.

85. Cotton Breeding in the Kara-Kalpak, U.S.S.R. By G. Gavrilov. (*Sovetskii Khlopok*, 3, 1940, p. 39. From *Pl. Bre. Absts.*, xi., 4, 1941, p. 304.) Early varieties were crossed with varieties possessed of other desirable qualities. In the F_1 only those plants equal or superior in earliness to the early parent were selected. In this way the variety C-925 was produced, which in 1938 yielded 32 c. per ha. as compared with 20 c. from the standard variety 1306. This new variety and C-2186 from the same cross have also excelled the existing varieties in spinning tests, the results of which are recorded.

86. South American Cottons. (*Man. Guar.*, 27/2/42.) The United States is likely to be the second largest importer of East Indian cotton during the current season, offsetting part of the loss through the closing of the Japanese outlet. It remains to be seen whether the development of inter-American trade will make the United States an important outlet for South American cottons, but it may be noted that this possibility is not mentioned in a recent survey of the position by the U.S. Dept. of Agriculture. This reports that cotton exports from Latin America have been declining steadily since the beginning of this season. Japan and China have been, during the last two or three seasons, the principal markets for most of the Central and South American countries which produce cotton surpluses, including Brazil, Argentina, Peru, Paraguay, Mexico, Haiti, Salvador, and Nicaragua, but most of the 1940-41 crops were disposed of before December 7, and stocks are not yet heavy except in Brazil and Peru. In those two countries, and in Argentina and Paraguay, Government loans or other price-supporting measures are already in operation. Brazil's crop in 1940-41 was 2,557,000 bales—a high "record"—and the carry-over on August 1 was 1,553,000 bales. The current crop is expected to be of much the same size as last season's, so that there will be a serious storage problem when it begins to move from up-country in March. Peru lost most of its continental markets at the outbreak of war, and its cotton carry-over at January 1, 1941 was 208,000 bales, a new high "record." Larger shipments to the Far East last year brought some decrease of stocks, but the carry-over at the beginning of this year, at 150,000 bales, was double the normal amount. The new crop is mainly picked between May and August, so that in Peru, also, there will be a heavy strain on warehouse facilities. The Argentine crop last season was small, being only 232,000 bales, or only 40,000 bales above local consumption. The current crop is understood to have suffered heavy damage through drought and frost, so that no large accumulation of stocks is likely there, while Mexico will probably also consume most of its own production, and Paraguay has only a small surplus.

87. Thailand: Cotton Production. (Dept. Agr. and Fisheries, Bangkok, *2nd Ann. Rpt. Cott. Exp. Sta.*, 1937-38. From *J. Text. Inst.*, xxxii., 10, 1941, A434.) Meteorological data and particulars of insect pests and diseases are

given and field trials are reported. The standard variety in cultivation is Cambodia, and early strains with good yield and resistance to jassids are being developed. In variety trials Punjab-American produced the highest yield, followed by Mexican Big Boll and Trice.

SOILS, SOIL EROSION AND MANURES.

88. Soils and Soil Management. By A. F. Gustafson. (McGraw-Hill Publishing Co., Ltd., London, 1941. Price 21s. From *Bull. Imp. Inst.*, xxxix., 3, 1941, p. 277.) This volume is written mainly for the use of the American student to provide a textbook on practical soil management, but it is also hoped that it will find a use in the wider field among those concerned with the ownership or utilization of land. Soil management and the various aspects of manuring are dealt with in detail, but it has only been possible to give an outline of the important subject of soil conservation. The author deals not only with the scientific problems relating to the soil, such as physical properties, soil organisms, humus, the functions of fertilizers, and so on, but also with such essentially practical questions as drainage and irrigation, tillage and rotation of crops. The work is provided with some excellent illustrations and contains many tables, while frequent references to literature occur as footnotes in the text.

89. Bibliography of Soil Science, Fertilizers, and General Agronomy, 1937-40. (Imperial Bur. Soil Science, Harpenden, England, 1941. Price 25s. From *Pl. Bre. Abs.*, xii., 1, 1942, p. 85.) The Imperial Bureau of Soil Science has compiled this bibliography by rearranging the references in Vols. I. to III. of "Soils and Fertilizers." It therefore also serves as a cumulative index to those volumes. The main part of the book is taken up by the bibliography, which is divided into two parts—main and geographical. At the beginning is an index to the classification numbers, being in effect extracts from the Universal Decimal System. The complement to this, the subject index, appears at the end of the book, and an author index is also provided. A list of abbreviations of the names of journals is given.

[*Cf.* Abstr. 646, Vol. XV. of this Review.]

90. Save the Soil with Contour Farming and Terracing. By E. W. Lehman and R. C. Hay. (*Ill. Agr. Coll. Ext. Circ.* 513, 1941. From *Exp. Sta. Rec.*, 85, 4, 1941, p. 448.) Emphasizes the well-known advantages of contour farming and terracing and presents practical information on systems of contour ploughing and planting, planning contour and terrace systems, locating and marking the lines, grass waterways and terrace outlets, constructing the terraces, maintaining a terrace system, and the cost of terracing. An appendix deals with the use and care of the level.

91. Soil Investigations by the Arizona Station. (*Ariz. Sta. Rpt.*, 1940. From *Exp. Sta. Rec.*, 85, 5, 1941, p. 589.) Progress in soil science research is reported on the soil changes which accompany water spreading, influence of organic matter decomposition on the physical and chemical properties of some Arizona soils, oxidation-reduction potentials of semi-arid soils, moisture relations in puddled soils, development of a capacitance bridge or soil-moisture meter, development of acidulated fertilizers through the use of a small amount of sulphur, a method for determining soil *p*H, and improved soil practices for cotton.

92. Soil Erosion in Trinidad and Tobago. By F. Hardy. (*Trop. Agr.*, xix., 2, 1942, p. 29.) Soil erosion in these islands is mainly insidious sheet erosion, which is variably affecting both sloping ground and flat alluvial lands. In

addition, clay soils within wet areas are subject to land-creep and land-slip movements (namely soil-creep, earthflow and débris avalanche; slump, débris-slide and débris-fall). Erosion in Trinidad and Tobago is described in this paper for each of the main topographical divisions—*i.e., Trinidad:* the Northern Range, Northern Plain, Central Range, Southern Plain, Southern Range, and Cedros Peninsula; *Tobago:* the Highland and the Lowland Regions. Soil conservation in the islands has not yet been systematically practised, nor has adequate publicity been afforded to it by competent authority. The co-operation of planters and landowners is essential in any attempt to stop further depredation.

93. Effectiveness on Cotton Soils of Granulated Mixed Fertilizers. By J. J. Skinner *et al.* (*Amer. Soc. Agron. J.*, 33, 4, 1941, p. 314. From *Cott. Lit.*, July, 1941, p. 266.) Granulated complete fertilizers of 4 to 6, 5 to 10, and 10 to 20 mesh size were compared with powdered and standard materials of the same composition when applied to cotton at five locations in North Carolina, South Carolina, and Georgia during a 3-year period. There was slightly less soluble salts in the soil of the seed zone when granulated fertilizers were used, the quantity decreasing with increase of particle size, but this variation did not significantly affect plant emergence. There was a trend below the level of significance for the larger granules to increase the yield of seed cotton.

94. Cotton Plant: Response to Minor Elements. By A. L. Sommer. (*Proc. Asscn. Southern Agr. Wkrs.*, 42, 1941, p. 94. From *J. Text. Inst.*, xxxiii., 2, 1942, A61.) When grown in greenhouse pot cultures on 16 Alabama soils cotton responded equally to both Mg and " minor " elements.

95. Cotton Plant: Effect of Soil *p*H. By W. R. Paden. (*Proc. Asscn. Southern Agr. Wkrs.*, 42, 1941, p. 93. From *J. Text. Inst.*, xxxiii., 2, 1942, A61.) Cotton on sandy loam at *p*H 5·5 or 5·0 made very slow growth as seedlings, and was highly susceptible to cold and insect injury by comparison with the vigorous growth and earlier maturity on plots at *p*H 6·0 or 6·5. The relative yields of seed cotton at *p*H 5·0, 5·5, 6·0 and 6·5 were 100, 112, 118 and 122 respectively.

96. Neutral *v.* Acid Fertilizers. By C. Dorman. (*Miss. Farm Res.*, iii., 9, 1940, p. 8. From *Exp. Sta. Rec.*, 84, 3, 1941, p. 302.) Adding about 500 lb. of dolomite limestone to each ton of an otherwise acid-forming 4-8-4-fertilizer cost about 30 ct. per acre, practically eliminated soil acidification, and increased the seed-cotton yield by about 90 lb.

97. Fired Soil as Fertilizer. (*Ind. Frmg.*, October, 1941, p. 530.) In the absence of proper soil management the heavy soils of India, such as the black cotton soils, very easily lose their tilth on wetting, and investigations have been carried out at the Institute of Plant Industry, Indore, to control this loss of tilth under field conditions. Encouraging results have been obtained by the use of lightly-fired soil, which does not become sticky when moistened with water, and which has proved markedly beneficial to cotton. A simple technique is given for the preparation of the fired soil.

98. Cotton Plant: Response to Potash. By N. J. Volk. (*Proc. Asscn. Southern Agr. Wkrs.*, 42, 1941, p. 55. From *J. Text. Inst.*, xxxiii., 2, 1942, A61.) Data from supposedly uniform experimental plots are used to demonstrate the difficulty of correlating the replaceable K content of the soil with yield responses when cotton is the crop.

99. Cotton Plant: Fertilizing with Gypsum. By E. D. Matthews. (*Proc. Asscn. Southern Agr. Wkrs.*, 42, 1941, p. 95. From *J. Text. Inst.*, xxxiii., 2, 1942, A61.) Ordinary superphosphate proved superior to triple superphosphate

as a fertilizer for cotton so long as little sulphate was also supplied. Gypsum increased the yield when used as source of sulphate with triple superphosphate, but when there was plenty of ammonium sulphate at hand the use of gypsum caused the yield to decline.

100. Evidence of the Value of the Sodium Ion in Cotton Fertilizers. By E. D. Matthews. (*Georgia Sta. Circ.* 127, 1941. From *Exp. Sta. Rec.*, **85**, 3, 1941, p. 341.) In fertilizer experiments with cotton, 1939-40, the crop receiving 600 lb. per acre of 5-10-5 fertilizer including N one-half as sodium nitrate and one-half as ammonium sulphate, averaged 945 lb. seed cotton per acre, and that receiving N as ammonium nitrate 890 lb., the difference apparently due to the Na ion. Other studies showed that Na is of distinct value to cotton on soils which respond to potash fertilization, as Clarksville gravelly silt loam, but of no benefit on soils plentifully supplied with potash, as Decatur clay loam. Benefits from Na, where they exist, may be about 40 per cent. as much as benefits from equivalent amounts of K.

101. Relation of Fertilizer Balance to Potash Hunger and the *Fusarium* Wilt of Cotton. By V. H. Young and W. H. Tharp. (*Bull. Arkansas Agr. Exp. Sta.*, 410, 1941. From *Rev. App. Mycol.*, xxi., **2**, 1942, p. 74.) In investigations conducted in Arkansas from 1937 to 1939 the cotton varieties Cook, Rowden 2088, and Half-and-Half were planted on fine alluvial soil in which cotton in earlier years had been seriously infected with *Fusarium* wilt (*F. vasinfectum*) and had shown marked symptoms of potash deficiency (rust). Nine different fertilizer treatments, based on 600 lb. of 6-8-6 (nitrogen, phosphorus, potassium) fertilizer per acre were tested, the proportions of the elements being varied to provide a series of complete and incomplete fertilizer combinations. The mean wilt intensities for the three varieties during the whole period were 2·74, 6·03, and 55·66 per cent. respectively. The effect of any treatment on any one variety was, however, similar to that on the other two. Thus, combinations with the least amount of potash (6-12-4) gave effective control of rust and conspicuously reduced wilt. The heaviest amounts of potash (6-12-12 and 0-4-12) gave the best control of wilt. Unbalanced applications (unfertilized controls, 6-8-0 and 0-8-0) increased wilt and induced pronounced rust. Phosphate used alone caused increased wilt, as compared with the non-fertilized controls. All the fertilizers except phosphate alone (0-8-0) gave highly significant yield increases on Half-and-Half. The highest potash application (6-12-12) gave better results than one in which the potash was reduced to one-third of this amount. Under the conditions of the experiment, potash applications gave definite control of rust (potash hunger) and very marked control of wilt, whereas high applications of nitrogen and phosphate, and of phosphate without potash, were either ineffective or detrimental. Increased susceptibility to attacks of *F. vasinfectum* was associated with increased severity of potash-deficiency symptoms.

102. The Effect of Fertilization and Cultural Practices on the Oil and Ammonia Content of Cottonseed Grown on Yazoo-Mississippi Delta Soils. By M. Gieger. (*J. Agr. Res.*, **63**, 1, 1941, p. 49.) Samples of cottonseed were collected annually over a 5-year period from 1933 to 1937 inclusive on plots of Sarpy loam located at the Delta Branch Experiment Station, Stoneville, Miss., which had received for a 10-year period prior to the first sampling the following treatments: (1) Commerical fertilizers, which included nitrogen, phosphorus, and potash; (2) green manures, which included hairy vetch, Austrian winter peas, sweet clover, bur clover, and rye; and (3) a variety of cultural practices, which included (*a*) different methods of seedbed preparation—namely, no ploughing, bedding in the fall, bedding in the spring, bedding in the fall and

rebedding in the spring; (*b*) uniform seedbed preparation followed by different methods of cultivation, which included hoeing only, harrowing only, cultivating 3 in. deep, 6 in. deep, 6 in. deep followed by 3 in. deep; and (*c*) variations in number of plants per hill with uniform spacing between hills.

The percentage of oil and ammonia was determined on all samples of cottonseed, with the following results: (1) Nitrogenous fertilizers decreased the percentage of oil in the seed but increased the percentage of ammonia; (2) phosphorus and potassium when used separately gave no increase in oil percentage, but when used together gave a slight increase, although its significance may be questioned; the percentage of ammonia was unaffected in either case; (3) green manures, like commercial fertilizers, increased the percentage of ammonia and decreased the percentage of oil on the basis of their nitrogen content. The different methods used in preparing the seedbed, cultivating and spacing, showed little if any influence on the percentage of oil and ammonia in the cottonseed. The quantity of oil and ammonia produced per acre was influenced somewhat by the different cultural practices, but any advantage of one practice over another is better measured by the quantity of oil and ammonia produced on the basis of acre yield than by the percentage of oil and ammonia in the cottonseed. Nitrogen in whatever form applied increased the ammonia content of the cottonseed.

103. Mississippi: Value of Dolomite for Cotton on Brown Loam Soils. By J. Pitner. (*Miss. Farm Res.*, August, 1941, p. 8. From *Cott. Lit.*, September, 1941, p. 351.) An increase in yield of 187 lb. of seed cotton per acre resulted from the application of 500 lb. dolomite in combination with 500 lb. of 6-8-8 per acre as the average of 4-year results from tests carried out on a farm at Benton, Mississippi.

104. Mississippi: The Influence on Cotton Production of Nitrogen, Phosphorus, and Potassium, and their Combination. By J. L. Anthony and J. Pitner. (*Miss. Sta. Bull.* 357, 1941. From *Exp. Sta. Rec.*, **85**, 3, 1941, p. 341.) Fertilizer tests with cotton during six years in co-operation with farms and sub-stations involved 400 lb. per acre rates of the 4-8-4, 0-8-4, 4-8-0, and 4-0-4 combinations on different soil types in the hill sections of Mississippi. Most, although not all, soils of sandy texture appeared to need N, P, and K for maximum economical cotton production. Soils of silt or clay texture were found to vary widely in response to combinations of fertilizers, some requiring NPK and others PK or NK for best results. Costs of fertilizer treatments and estimated profits per acre are given for each experiment. Since such wide differences exist among soils and even between soils on any one farm, all fertilizer recommendations are deemed of a general nature and must be adapted by the farmer to his own requirements and conditions. Simple field tests are outlined for farmers desiring to determine their specific fertilizer needs.

105. Mississippi: Profit from $100 Spent for Cotton Fertilizer. By W. B. Andrews. (*Miss. Sta. Bull.* 342, 1940. From *Exp. Sta. Rec.*, **84**, 3, 1941, p. 325.) Experimental data on the effects of formulas and rates of fertilizers for cotton on profits obtained in the hill sections of Mississippi are given in detail for several agricultural areas, and summarized. Recommendations based on the data and other available information are for limestone uplands 200 lb. each of ammonium sulphate and of superphosphate, Brown loam upland 600 lb. of 4-8-4, all other uplands 500 lb. of 6-8-4 or 450 lb. of 8-8-4, and silt and sandy loam first and second bottoms 600 lb. of 4-8-8 fertilizer. Modifications of the rates and formulas and of the suggested home mixtures are indicated for special conditions. Using 1,200 lb. per acre of 4-8-4 fertilizer, costing $15·94 when factory mixed and $12.64 when home mixed, was more profitable than 600,

1,800, or 2,400 lb. on all soils except the Brown loam upland, on which 600 lb. was most profitable. Comments are also made on methods of applying fertilizers, which depend on the rate per acre and the soil; the need of all soils for nitrogen, but not necessarily the recommended quantity of phosphorus and potash; the effect of depression years on the ratio of nitrogen, phosphorus, and potash applied; and the influence of fertilizers on the available lime, phosphorus, and potash in the soil.

106. FERTILIZER EXPERIMENTS WITH ACALA COTTON ON IRRIGATED SOILS. By D. A. Hinkle and G. Staten. (*New Mexico Sta. Bull.* 280, 1941. From *Exp. Sta. Rec.*, **85**, 6, 1941, p. 756.) Fertilizer tests with Acala cotton grown continuously on an irrigated Gila clay adobe soil, 1929-40, are reported. Annual acre applications of 135 lb. of treble superphosphate or 150 lb. of ammonium sulphate did not materially affect yield, staple length, lint percentage, boll size, or maturity of cotton grown on this heavy soil. Their combination increased yields slightly but not profitably. Annual applications of manure resulted in an average increase of 143 lb. of lint cotton per acre over unfertilized plats, a significant and paying response. None of the fertilizer treatments used reduced the percentage of diseased (*Verticillium* wilt) plants, which were most numerous on the lighter-textured soil areas of the field. Fertilizers used alone or in combination did not materially affect the total N, organic matter, or reaction of the surface or subsurface soil. Those containing P increased the available phosphate content. Use of manure increased total N, organic matter, and available P of the soil, but did not affect the reaction. In a second test on a lighter type of soil, 1937-40, a small response was obtained from either ammonium sulphate or superphosphate and a very good one from 16-20-0 Ammo-Phos. Annual applications of manure resulted in the greatest response even when manure supplied about the same amount of plant food as the commercial fertilizer, and also produced a much greater percentage increase in yield on poor light soil than on heavy soil. Comparisons of different kinds of S on a very heavy plastic soil failed to show an increase in cotton yield compared with unsulphured plats.

107. TEXAS: TESTS OF NITROGENOUS FERTILIZERS FOR COTTON. By E. B. Reynolds. (*53rd Ann. Rpt. Texas Agr. Exp. Sta.*, 1940, p. 61.) Of the five materials included in the test in 1940, sulphate of ammonia and uramon made the largest yields—215 and 313 lb. lint per acre respectively. During the last nine years, however, nitrate of soda has produced the highest acreage yield—269 lb. lint per acre, which is only slightly higher than the yield of 258 lb. from soil treated with sulphate of ammonia. This slight difference in yield is probably not significant.

108. COTTON SEEDLINGS: EFFECT OF BORON. By J. R. Piland. (*Proc. Asscn. Southern Agr. Wkrs.*, **42**, 1941, p. 95. From *Summ. Curr. Lit.*, xxii., **2**, 1942, p. 25.) The boron content of North Carolina soils is discussed. Cotton seedlings were injured if planted immediately after the addition of more than 1 p.p.m. of boron to the soil, but if planted after soy beans were not injured in a soil containing 0·96-1·44 p.p.m.

109. COMPOST. (*Farmg. in S. Afr.*, September, 1941, p. 299.) Discusses methods of preparing compost, and gives the following brief description of a method successfully applied at co-operative demonstrations in the irrigated areas of Upington, Rust-der-Winter, Rustenburg, and Marico, South Africa, during the past two seasons: Wheat straw soaked for 2-3 days in a hole filled with water, and subsequently worked into heaps 6 feet wide. On each 1-foot layer of straw 3 inches of kraal manure are spread, or a 2 : 2 : 1 mixture of ammonium sulphate,

agricultural lime, and superphosphate respectively (at the rate of approximately 120 lb. per ton of dry material), is strewn on the wet material and worked in with a pitchfork. In this manner a heap 6 feet high is built up. It was found unnecessary to add more water or to turn the heaps. After approximately two months the straw was sufficiently decomposed for use.

110. THE MANUFACTURE OF HUMUS. By H. M. L. (*Madras Agr. J.*, March, 1941, p. 112.) A useful description of " what humus is and how it is prepared," and including also a description of the Indore process.

STATISTICAL TREATMENT, CULTIVATION, IRRIGATION, GINNING, ETC.

111. STATISTICAL THEORY OF ESTIMATION. By R. A. Fisher. (Calcutta Readership Lectures, 1938. From *Pl. Bre. Absts.*, xi., **4**, 1941, p. 334.) This booklet contains a series of lectures given to the Statistical Conference at Calcutta in 1938. It is based on the author's own publications during the years when he developed his theory of estimation. This theory is concerned with achieving maximum precision in the estimation of what are called parameters. For example, if we wish to estimate the value of the recombination fraction from observed frequencies with which the phenotypes have occurred, or we may have to estimate the nitrogen contents of barley corn in a field from that in samples analyzed, or we may wish to calculate the parameters in Mitschlich's law of diminishing returns from the observed response of yields to the application of manure at increasing levels. It is shown how the method of estimation varies in accordance with the statistical distribution law which the observed data follow. If this law is known, the theory provides a means of estimating where possible the parameter sought with maximum precision (calculation of " sufficient statistic "). In cases where a " sufficient statistic " cannot be found the theory yields the loss in precision which arises through using a less " efficient statistic " for the estimation. In this booklet the author confines himself to giving the general theory, which is developed in masterly briefness and conciseness. It is assumed, however, that the reader is acquainted with certain results of advanced calculus. Details of the application of the theory to particular cases are to be found in numerous papers by the author and others.

112. BEHRENS' INTEGRAL: ASYMPTOTIC APPROACH. By R. A. Fisher. (*Ann. Eugenics,* **11**, 1941, p. 141. From *Summ. Curr. Lit.*, xxii., **2**, 1942, p. 53.) A certain amount of confusion and controversy has arisen in respect of the test of significance, first given by Behrens, for the difference between the means of two samples not supposedly drawn from equally variable populations, or from populations having a known variance ratio. In such cases not only a single hypothetical variance, but the ratio of two such variances, require to be " Studentized," or eliminated, by means of its fiducial distribution. In the present paper the logic of this and analogous inferences is examined.

113. THE ANALYSIS OF INCOMPLETE SPLIT PLOT DESIGNS. By P. V. Krishna Ayyar. (*Sci. and Cult.*, **6**, 1941, p. 487. From *Pl. Bre. Absts.*, xi., **4**, 1941, p. 252.) The split plot technique in field experiments provides for two experimental errors (*a*) and (*b*), one for the comparison of main treatments (usually differences in field cultivation) and the other for the more accurate test of subtreatments (usually manurial), and the interactions. Whilst the analysis of a *complete* split plot design follows straightforward lines of analysis of variance, a difficulty arises in the separation of the two errors in an *incomplete* split plot design. Following the customary technique of fitting constants to represent

treatment and block differences, the author subtracts the variation between these constants from the total sum of squares to obtain as a residual the compound error (*a*) plus (*b*). To split this into its components it is sufficient to estimate error (*b*). To this end all main plots are grouped so that plots with the same main treatment are in the same group, each group being regarded as a separate hypothetical experiment. For each group the residuals are then calculated by the standard method of fitting constants, and pooled to form the sum of squares of error (*b*). The degrees of freedom are split correspondingly.

114. THE ANALYSIS OF QUASI-FACTORIAL DESIGNS WITH INCOMPLETE DATA. 2. LATTICE SQUARES. By E. A. Cornish. (*J. Aust. Inst. Agr. Sci.*, **7**, 1941, p. 19. From *Pl. Bre. Absts.*, xii., **1**, 1942, p. 1.) There are two types of statistical analysis dealing with incomplete data. The one (of which the well-known missing plot technique is an example) deals with experiments where the data referring to a single plot (or a number of plots with random positions) are missing or unreliable. The other deals with cases where the missing plots constitute a definite experimental group such as the plots in a row of Latin Squares or the set of plots treated alike in a randomized block experiment. In this paper of his series the author deals with incomplete data of the latter kind and considers Lattice Squares (quasi-Latin-Squares) in which a complete row (column) is missing or where all data referring to a treatment are lost or unreliable. Formulæ for the analysis of variance are derived by the standard method of fitting constants. Whilst the case of a " missing treatment " is comparatively easy, the analysis of a Lattice Square with a missing row (column) is complicated; the comparison of the yields of plots under the two different treatments has to be carried out in separate groups according to their position relative to the missing row (column).

[*Cf.* Abstrs. **111**, **112**, **375**, Vol. XVIII. of this Review.]

115. BINOMIAL DISTRIBUTIONS: FITTING. By J. B. S. Haldane. (*Ann. Eugenics*, **11**, 1941, p. 179. From *Summ. Curr. Lit.*, xxii., **2**, 1942, p. 53.) The author shows that a binomial law can readily be fitted to observed data by the method of maximum likelihood.

116. COMPARAISON DE DIFFÉRENTES MÉTHODES D'EXPÉRIMENTATION PHYTOTECHNIQUE. By J. S. Papadakis. (*Rev. Argent. Agron.*, **7**, 1940, p. 297. From *Pl. Bre. Absts.*, xi., **4**, 1941, p. 262.) The author develops a new method of comparing the efficiency of field designs. The comparative effectiveness of different methods of local control depends on the fertility trends on the experimental site. Thus, in the case of two definite trends (lengthways and across the field) a Latin Square will be more effective than a randomized block method, whilst for " patchiness " the randomized blocks will often achieve better local control. With the author's methods fertility trends are classified by certain characteristic values which could be obtained from the yields of a uniformity trial on the site. These characteristics are: r_k the correlation between (yields of) plots in the same block containing k plots, r_l and r_c the respective correlations between plots in the same row or column, r_1 the correlation between neighbouring plots and r_2 the correlation between plots in the same row or column but separated by one plot. The experimental errors in various designs such as randomized blocks, factorial designs (with two or three factors), incomplete randomized blocks of various types, are expressed in terms of the above characteristics. The idea is an extension of the conception of R. A. Fisher's intracorrelation, and the author has developed a new technique of local control which makes use of the above correlations r_1 and r_2. In the simplest case the idea is roughly to use every second experimental plot, called test plot (témoin), to construct a fertility distribution of the experimental site and then to correct the remainder of the

plots, the "non-témoins," for local fertility. To this end deviations from respective treatment means are taken for all test plots, and the correction to each non-témoin yield is then given by the mean deviation in the two adjacent test plots. The resulting error of the corrected yields depends on the correlation r_1 and r_2. For certain fertility trends the author's method is more efficient than standard designs, and the author is able to demonstrate this with the help of data obtained in a uniformity trial in the Punjab. These data are also used as an example for the calculations of the experimental error by the new method. One difficulty about the new method is that corrections applied to the yields of two neighbouring "non-témoin" plots are not independent; moreover, treatment mean square and error mean square are not orthogonal. Standard tests of significance are therefore not applicable. The author does not consider the question of significance. If the appropriate test can be evolved at all it would certainly be complicated.

117. Some Problems in Handling and Interpreting Plant Disease Data in Complex Factorial Designs. By W. R. Tharp *et al.* (*Phytopathology*, **31**, 1941, p. 26. From *Pl. Bre. Absts.*, xi., **4**, 1941, p. 262.) Data on the incidence of plant diseases are often expressed as percentages (such as the percentage of plants affected), and are therefore liable to follow distribution laws which differ from the normal curve. The authors have encountered this difficulty in an experiment designed factorially to study N-, P-, K-nutrition of three varieties (Cook 307, Rowden 2088 and Half-and-Half) of cotton in relation to their comparative resistance to *Fusarium* wilt in sand culture in a greenhouse. Two difficulties arise. Firstly, there is heterogeneity in the variance, since a susceptible variety (like Half-and-Half) will show considerable variation in wilt incidence under different nutritional conditions, whilst the variety Cook 307 (considered wilt-resistant) will show little variation. Secondly, the recorded data will not be normally distributed. This latter difficulty is usually overcome by a transformation of the data prior to the analysis of variance. The customary transformations are applied to the data, but only the logarithmic one diminishes the heterogeneity of variance significantly. Moreover, the study of interactions on "the logarithmic scale" has a practical meaning, whilst interactions are only of academic interest where angular and square root transformations are used. As an alternative to transformations, the authors discuss methods of splitting the heterogeneous variance into homogeneous components. With an analysis of this kind, each treatment effect is tested against its own experimental error, so that there is some loss of experimental accuracy. Two important aspects have been ignored. One is the possibility of modifying the test to account for heterogeneity and non-normality. Secondly, no precautions have been taken to safeguard against biassed significance through selection. With as many as 29 interactions set out in Table 4 of the paper one would expect that one or two in the sample of mean squares will exceed the 5 per cent. point of significance, even if none of the interactions is real.

118. Cottonseed Disinfection in War-time. By A. S. Boughey. (Abstr. from *Nature*, 10/1/42.) In the Sudan cottonseed has to be treated with a mercurial dust for the control of blackarm (*Bacterium malvacearum*), present in the seed as an external infection. On the outbreak of war the possibility arose of there being a shortage of mercurial dusts in the country, and it became expedient therefore to provide an alternative method for the disinfection of cottonseed in the event of such an emergency. *B. malvacearum* in cotton débris is destroyed when cotton fields are flooded for a period of 4 days with irrigation water. The disappearance of the organism is attributed to the action of a bacteriophage. Experiments were performed to discover whether *B. malvacearum*

on cottonseed could be destroyed in a similar manner. It was found that after steeping cottonseed for 48 hours in four times its own weight of irrigation water practically all traces of external infection by *B. malvacearum* had disappeared. In small-scale plant-house experiments on seed which when untreated gave 14 per cent. infected plants, complete control of the organism was obtained. A larger field experiment, using infected seed from the same source, gave 0·26 per cent. infected plants after the steeping treatment, and complete control after using a mercurial dust, Abavit B. Germination of the seed is depressed by the steeping treatment, but not seriously so. In a field experiment unsteeped seed gave 79 per cent. germination, and steeped 72 per cent. The steeped seed had been dried and stored for a short period after treatment. If the steeped seed cannot be sown wet immediately, and has to be dried and stored, the drying process must be rapid and thorough, otherwise the seed will promptly germinate. From laboratory experiments it would appear that the organism disappears from the surface of the seed during steeping, not through the activity of a bacteriophage, but through exposure to anaerobic conditions. These conditions are the result of bacterial activity, and oxygen absorption by the germinating seeds. The growth of *B. malvacearum* in culture is closely conditioned by the amount of oxygen present.

119. Cottonseed: Effect of Sterilization on Germination. By C. H. Rogers. (*Proc. Asscn. S. Agr. Wkrs.*, **42**, 1941, p. 193. From *Summ. Curr. Lit.*, xxii., **2**, 1942, p. 26.) A series of experiments are reported in which nine organic Hg compounds, delinting with sulphuric acid, three combinations of delinting and dusting with Hg compounds, and yellow and red Cu oxides were compared for their effects on germination and the yield of cotton. The copper oxides gave poor results, but the other treatments improved germination by 5-45 per cent. and reduced seedling infection by 3-20 times. Delinting was particularly useful. The incidence of angular leafspot disease over a 4-year period was reduced from 41 to 7 per cent. by dusting with Ceresan or by delinting with acid.

120. Cottonseed Disinfectants: Efficiency Tests. By D. C. Neal. (*Proc. Asscn. S. Agr. Wkrs.*, **42**, 1941, p. 197. From *J. Text. Inst.*, xxxiii., **2**, 1942, A62.) Results of tests on proprietary organic mercury compounds, ethyl mercuriborate, cyanamide and copper-mercury dust are reported.

121. Cottonseed Delinting Machine. Chemical Seed Treating and Delinting Corporation. (U.S.P. 2,240,503 of 15/7/37. From *Summ. Curr. Lit.*, xxi., **21**, 1941, p. 516.) The claim is for a machine in which cottonseed travels continuously first on an inclined frame through an acid bath where the lint is removed, then through a washer where loose lint and excess of acid are removed, then through a "floater" where trash and defective seeds are skimmed off, and finally through a dryer. Movement through the various sections is provided by rotary means.

122. Cottonseed Delinting Machine. Hoefling Bros. (Sacramento, California. U.S.P. 2,242,302 of 15/1/40. From *Summ. Curr. Lit.*, xxi., **22**, 1941, p. 536.) The seed is fed into a cylindrical casing in which is a rotary brush with long, resilient bristles, and a current of air from a fan is directed tangentially to the brush against the direction of rotation. The lint passes away with the air and the seed emerges from a hole at the bottom of the casing.

123. A Device for Converting Small Cotton Gins for Use in Delinting Cottonseed. By W. W. Ballard. (*Ga. Sta. Circ.* 129, 1941. From *Exp. Sta. Rec.*, **86**, 1, 1942, p. 101.) To provide means for delinting, for experimental purposes, smaller quantities of seed than can be handled in commercial machines, the author devised mechanical attachments for converting the small 10- to 20-saw gin into a seed delinter. The parts required are: (1) A revolving float, or 4-inch

cylinder, carrying four 0·75-inch angle-iron flanges, operating inside the roll box, to keep the seed roll spinning while the gin is in operation; (2) a special seed grid designed to prevent seed from being thrown out of the roll box until delinting has been completed; and (3) a curved baffle plate attached to the top of the roll box to reduce the feed opening and prevent bulging of the seed roll as it revolves. No permanent alteration to the equipment interfering with normal operation of the gin is involved. The special parts required for delinting may be easily removed and the standard parts replaced in a few minutes.

124. COTTON GIN AIR INTERCEPTING VALVE. Lummus Cotton Gin Co. (U.S.P. 2,235,017 of 1/10/40. From *J. Text. Inst.*, xxxii., **10**, 1941, A442.) The claim is for a combination of gins, a mote conveyor extending along and through them, a housing for the conveyor between adjacent gins, and air-intercepting valves in the housing.

125. AMERICAN-EGYPTIAN COTTON QUALITY AND GINNING. By A. J. Johnson *et al.* (*U.S. Dpt. Agr., Agr. Mktg. Serv.*, 1941. From *Cott. Lit.*, December, 1941, p. 497.) Summarizes information obtained through experiments and surveys conducted in connection with the ginning of American-Egyptian cotton by the U.S. Dept. of Agriculture and other agencies.

126. GINNING OF SEA ISLAND AND AMERICAN COTTON IN 1940. By F. L. Gerdes. (*Cott. and Cott. Oil Press*, **42**, 17, 1941, p. 11. From *Cott. Lit.*, September, 1941, p. 357.) Ginning preparation of the two types of cotton and facilities for ginning extra long staple cotton are discussed.

127. BALING PRESS. Lummus Cotton Gin Co. (U.S.P. 2,241,063 of 9/1/39. From *Summ. Curr. Lit.*, xxi., **21**, 1941, p. 516.) A baling press with separable doors has two of the doors pivotally mounted on a supporting member, a hydraulic piston fast on one door surrounded by a cylinder, and link means connecting the hydraulic cylinder with the other door. By forcing a fluid into the cylinder the doors are held assembled.

128. COTTON BALE PRESS RETAINER CONTROL. Gullett Gin Co. (Amite, La., U.S.A.; U.S.P. 2,237,721 of 24/11/39. From *J. Text. Inst.*, xxxii., **10**, 1941, A442.) A baling press has press boxes that can swing about a supporting post to come alternately under a tramper and a ram. Retainer units are mounted along the sides of the boxes, comprising a vertical shaft and lateral retainers extending at intervals at one side of it. A system of levers and balancing weights is provided so that the retainer units are in position when the press box is under the tramper, but swing free at other times.

129. THE COMPRESSION OF COTTON, AND RELATED PROBLEMS. By J. W. Wright and C. A. Bennett. (*U.S. Dpt. Agr., Agr. Marktg. Serv.*, 1940. From *Exp. Sta. Rec.*, **86**, 1, 1942, p. 110.) The development, distribution, and organization of the industry, the types of equipment, volume of cotton handled, rates charged, distribution of the cotton from the compressors, and the special problems associated with compression, are discussed.

COTTONSEED AND OIL.

130. COTTONSEED, SOYBEAN AND PEANUT OILS: REMOVAL OF FINELY DISPERSED COLLOIDAL COLOURING SUBSTANCES. By R. H. Fash. (U.S.P. 2,229,062 of 21/1/41. From *J. Text. Inst.*, xxxii., **10**, 1941, A496.) Finely dispersed colloidal material remaining in the oil after preliminary refining is removed by treatment with X-rays or ultra-violet rays to reduce the state of dispersion of the colloidal material to be removed.

131. Determination of Gossypol in Crude Cottonseed Oil. By H. D. Royce *et al.* (*Indus. Eng. Chem.*, Analyt. Ed., **12**, 12, 1940, p. 741. From *Cott. Lit.*, July, 1941, p. 294.) A mixture of pyridine and aniline is more effective than aniline alone in precipitating gossypol from crude cottonseed oil. A modification of the pyridine-aniline method, which recovers up to 96 per cent. of gossypol from a 0·2 per cent. solution in oil, is described.

132. Molecular Distillation and Low Temperature Crystallization of Cottonseed Oil and the Stability of the Molecularly Distilled Fractions. By R. W. Riemenschneider *et al.* (*Oil and Soap*, **17**, 7, 1940, p. 145. From *Exp. Sta. Rec.*, **85**, 3, 1941, p. 294.) Molecular distillation of 1,400 gm. of the oil showed a small degree of fractionation of the glycerol esters. Unsaponifiable material was largely concentrated into the first fraction. Fractional crystallization from acetone at various temperatures ranging from 0° to − 65° C. gave results indicating that crystallization methods may be used to advantage in connection with other physical and chemical methods for the separation of the oil components.

PESTS, DISEASES AND INJURIES, AND THEIR CONTROL.

133. Advances in Entomology. By C. H. Richardson. (*Indus. Eng. Chem.*, News Ed., **19**, 2, New York, 1941. From *Rev. App. Ent.*, xxix., Ser. A, **10**, 1941, p. 483.) Gives brief notes on results recorded in 178 papers dealing chiefly with recent work on insecticides, and thus serves as a useful index to the literature concerned. It is arranged under the following headings: Stomach Poisons: Contact Poisons; Control of Termites and other Wood-Infesting Insects; Insecticides of Plant Origin; Wetting and Spreading of Sprays; Fumigants; Attractants and Repellents; Methods for Testing Insecticides and Evaluating Toxicological Data; Reviews.

134. Entoma: A Directory of Insect Pest Control. By C. C. Hamilton (Editor). (Eastern Br. Amer. Ass., Econ Ent., New Brunswick, N.J., 1941. Price $1.00. From *Rev. App. Ent.*, xxix., Ser. A, **9**, 1941, p. 438.) The lists in this fourth edition have been considerably expanded. In addition to those previously included, it now contains lists of moth-proofing testing laboratories, firms engaged in vacuum fumigation, dusting and spraying from aircraft and the production of motion-picture films of insects, trade-marked insecticides, fungicides and adjuncts, insecticide and fungicide manufacturers, the agricultural experiment stations of the United States, and entomological societies in the United States and Canada. The introductory survey of insecticides includes notes on several materials that have shown promise in recent research.

135. Entomophagous Insects. By C. P. C. Clausen. (McGraw-Hill Pubg. Co., Ltd., London, 1940. Price: £2 9s. From *Rev. App. Ent.*, xxix. Ser. A, **9**, 1941, p. 431.) With the growth of interest in the method of biological control of insect pests, the literature dealing with insect parasites and predators has assumed formidable proportions. Important contributions have been made by workers in many different countries, so that the student has access to only a small fraction of the published material. The author has therefore sought to make this work a comprehensive survey of the biology and host relations of the various kinds of entomophagous insects, designed to be of value to investigators engaged in field work on insect parasitology and the biological control of insect pests. The book is divided into sixteen main sections, each dealing with a separate insect Order; that dealing with the Hymenoptera occupies about half of it. Families are considered separately, individual species being cited as examples, and those containing parasites, in which the host relationships are highly specialized

and the immature stages show considerable morphological adaptation to their mode of life, are treated at greater length than those containing the more generalized predators. Full references are given for the information cited in the text.

136. A Factorial Experiment Comparing Insecticides for Control of Cotton Insects. By J. C. Gaines. (*J. Econ. Ent.*, **34**, 4, 1941, p. 512. From *Exp. Sta. Rec.*, **86**, 1, 1942, p. 66.) A report of a 36-plat factorial experiment conducted in the Brazos River Bottoms near College Station, Texas, to secure information on the value of insecticides used in a schedule of applications for the control of cotton insects. Comparisons between the several treatments—*i.e.*, no treatment, sulphur alone, three stomach poisons, and the combination of sulphur and later applications of the stomach poisons—were made. Sulphur applied early in the season reduced the flea-hopper infestation, but did not affect the yield. Applications of all stomach poisons significantly decreased the bollworm injury, boll-weevil infestation, and rapid plant bug population, and significantly increased the aphid population and yield. Natural cryolite-sulphur, 85-15, and lead arsenate-clay, 90-10, were more effective against bollworms than calcium arsenate, but less effective against the rapid plant bugs and were followed by fewer aphids. The arsenicals were more effective against weevils than the cryolite mixture. Using yields as the criterion, all stomach poisons were equally effective.

137. A Laboratory Spraying Apparatus and Technique for Investigating the Action of Contact Insecticides, with Some Notes on Suitable Test Insects. By C. Potter. (*Ann. App. Biol.*, **28**, 2, 1941, p. 142. From *Rev. App. Ent.*, xxix., Ser. A, **11**, 1941, p. 591.) Studies were carried out to determine a laboratory method of applying sprays containing contact insecticides in equal doses to large numbers of insects belonging to a wide variety of species. Methods described by other workers are discussed, and an account is given of the investigations leading to the development of the apparatus finally adopted, which is described. It has a reservoir and a specially designed atomizing nozzle mounted on a small circular plate carried on three bars each at an angle of 120° with the others. The end of each bar rests on the top of a metal tower, through which the spray is directed on to a spray plate or dish. This plate is carried on another, which is fitted with a universal adjustment. The whole apparatus is mounted on a wooden stand. Tests performed to determine its physical performance are described.

138. Report of the Chief of the Bureau of Entomology and Plant Quarantine, 1939-40. By L. A. Strong. U.S. Dpt. Agr., Washington, D.C., 1940. From *Rev. App. Ent.*, xxix., Ser. A, **9**, 1941, p. 425.) Ants tending root aphids on cotton were effectively controlled by sweetened baits containing thallium acetate and thallium sulphate, placed in small aluminium cans about 10 in. apart along every third row of plants, and, at less cost, by one composed of ½ lb. tartar emetic, 1 U.S. quart cane syrup, and 1 lb. sugar mixed with 1 U.S. gal. water, and absorbed by sawdust or cottonseed hulls, which was distributed in small handfuls under the plants. Sawdust was less satisfactory as a carrier than cottonseed hulls, 12 lb. of which are sufficient to absorb about 2½ U.S. gals. bait and to treat 1½-2 acres of cotton. The best results were obtained when the bait was applied on warm sunny days following cool nights, when the soil had been packed by rain and the plants were just appearing above ground. Since root aphids feed on many common cultivated and wild plants, they are abundant on cotton following crops in which weeds develop during the autumn and winter. Most of the damage by the bollworm *Heliothis armigera* to cotton in experimental plots in Texas was caused by larvæ of the second

generation. Dusts of lead arsenate and cryolites containing 97, 90, 83 and 30 per cent. sodium fluoaluminate gave almost equal control and increased the yield of seed cotton by 110-126 per cent., whereas a mixture of cryolite and sulphur containing 16·5 per cent. sodium fluoaluminate increased it only by 29 per cent. Dusts containing barium fluosilicate and calcium arsenate gave increased yields of 64 and 56 per cent. respectively. The ability of the pink bollworm (*Platyedra gossypiella*) to overwinter in New Mexico was demonstrated for the first time when larvæ in infested bolls under hibernation cages survived the winter of 1939-40. An experiment showed that delayed planting of cotton decreases initial infestation, because adults emerge before squares are available for the larvæ, but increases the population entering hibernation in autumn, since the crop matures later. Evidence was obtained that breeding almost certainly continues throughout the winter in the lower Rio Grande Valley under normal conditions and if food is available. Some larvæ entered diapause as early as July. Larvæ in diapause occurred in old bolls and locks of cotton on plants and on the soil surface or buried in the soil throughout the winter and as late as April, but no larvæ were found in loose cocoons in the soil. Although about 50 species of malvaceous plants occur in this region, only okra (*Hibiscus esculentus*) and *Malvaviscus drummondi* were infested. A rearing stock of *Microbracon kirkpatricki*, Wlkn., for use against *Platyedra gossypiella*, was imported from Egypt.

139. Entomology. By F. L. Thomas *et al.* (*Rpt. Texas Agr. Exp. Sta.*, **52,** 1938-39. p. 51. From *Rev. App. Ent.*, xxix., Ser. A, **10,** 1941, p. 499.) A survey of work carried out on insect pests in Texas in 1939, particularly on the usual pests of cotton. The Pentatomid *Chlorochroa ligata*, Say, is a pest of cotton and other crops in the arid and semi-arid districts of the south-western United States, and may become a major pest of flax, particularly where mesquite (*Prosopis*) is also present. Preliminary experiments showed that it is capable of delaying the production of flax and reducing the quantity and quality of the seed. It overwinters in the adult stage, and requires about a month for development from egg to adult. The females lay 1-3 clusters of about 40 eggs each. The Tachinid, *Gymnosoma fuliginosum*, R.-D., which parasitizes 10 to 20 per cent. of the nymphs and adults in June, and an unidentified Hymenopterous parasite that destroyed approximately 30 per cent. of the eggs during May are important in controlling the bug in summer.

140. Cotton Insect Pests: Control in Argentina. By J. B. Marchionatto. (*Bol. Mensual.*, **68,** Buenos Aires, 1940, p. 594. From *J. Text. Inst.*, xxxii., **10,** 1941, A436.) Arrangements for the control of cotton pests in Argentina and recent progress in this section are discussed. Seed disinfection with carbon disulphide has been found unsatisfactory, and ginneries have been equipped with apparatus for seed disinfection by heat treatment. For the spraying of plants in the field, calcium arsenate is recommended in preference to Paris green or "fluido larvicida D.A." The use of aeroplanes for the application of such insecticides has given promising results.

141. New Œstroid Flies from Brazil. By C. H. T. Townsend. (*Rev. Ent.*, **11,** Rio de Janeiro, 1940, p. 889. From *Rev. App. Ent.*, xxix., Ser. A, **9,** 1941, p. 469.) The new Tachinids described include *Paraphasiana dysderci*, gen. et sp. n., reared from adults of *Dysdercus ruficollis*, L., and *D. mendesi*, Blöte, and *Winthemia* (*Hemimasipoda*) *alabamæ*, sp. n., from *Alabama argillacea*, Hb., both in São Paulo, Brazil.

142. Insect Pests of Burma. By C. C. Ghosh. (Pubd. Supt. Govt. Prtg. and Stat., Burma, 1940. Price: Rs. 7-8. From *Ind. J. Agr. Sci.*, xi., **2,** 1941,

p. 319.) An attempt to acquaint general readers with the elementary facts about insect life, and with the common insect pests of Burma, about which little information is at present available. Simple methods, wherever possible, have been suggested for action against the pests. Technical descriptions have been reduced to the minimum, and the book appears to be meant primarily for general readers. Part I deals with general facts about insect life, classification, and the prevention and control of insect injury by chemical and biological means. Part II is concerned with general pests and those of the different agricultural crops. The book is well furnished with good illustrations, and is a useful addition to the literature on tropical insect pests.

143. Beginnings of a North China Pest Survey. By C. L. Liu. (*Peking Nat. Hist. Bull.* 15, Peking, 1941, p. 225. From *Rev. App. Ent.*, xxix., Ser. A, 9, 1941, p. 446.) An account is given of a survey of the insect pests of cultivated crops and trees started in North China in 1934 and continued until the outbreak of war with Japan. Many of the records obtained during the survey were destroyed, but the food plants, injurious stage and distribution of 115 species, and the degree of injury each causes are given in a table; of these species, about 50 per cent. are Lepidoptera and about 20 per cent. Coleoptera. Brief notes are added on some of the outstanding pests, including a few undetermined species that do not appear in the table. The chief pests of cotton are *Aphis gossypii*, Glov., and *Sylepta derogata*, F. American cotton is more susceptible to the latter than native cottons.

144. India: Report of the Imperial Entomologist. By H. S. Pruthi. (*Sci. Rpt. Agr. Res. Inst.*, New Delhi, 1939-40, p. 102.) Ecological work on the spotted bollworm of cotton (*Earias fabia*), and its important parasite *Microbracon lefroyi*, was continued. Under a saturation deficiency of 3 mm. the optimum temperature for oviposition by *E. fabia* was 25° to 30° C. A temperature of 35° C. during the entire life of the insect caused marked sterility, but was not so injurious when the influence of temperature was on the pre- or post-imaginal stage alone. The duration of the adult life was found to decrease with the increase of temperature. Although *Earias* spp. are the favourite hosts of *M. lefroyi*, it would appear that the latter have an acceptable alternative host in the pink bollworm during the off-season. A temperature of 20° C. was found to be the most suitable for the egg-laying activities of this parasite, but humidity between 0 and 3 mm. had no effect either on its longevity or fecundity. Studies on the effect of high temperature on the pink bollworm during the year showed that exposure of naked larvæ for about 24 to 30 hours to 45° C., for 1 to 1½ hours to 50° C., for 7 to 10 minutes to 55° C., for 5 minutes to 60° C., for 2 to 3 minutes to 65° C., and for 1 minute to 70° C. was fatal. To kill larvæ inside "double seeds," however, exposure of over 3 hours to 50° C., of 40 minutes to 55° C., of 15 minutes to 60° C., of 7 to 10 minutes to 65° C., and for 2 to 3 minutes to 70° C. was found necessary.

Work on the identification of parasites was continued, and among the species studied was *Eretmocerus masii*, Silv., parasitic on the nymph of *Bemisia gossypiperda*. In tests on the value of some insecticides of vegetable origin benzene extract of the seed of *Tephrosia candida* was successfully sprayed against *Bemisia gossypiperda*.

[*Cf.* Abstr. 175, Vol. XVII. of this Review.]

145. Capsid Pests of Cacao in Nigeria. By F. D. Golding. (*Bull. Ent. Res.*, 32, 1, 1941, p. 83. From *Rev. App. Ent.*, xxix., Ser. A, 10, 1941, p. 515.) The Capsid pests of cacao in West Africa are discussed from the literature, and notes are given on the occurrence in recent years in two districts in Southern Nigeria of *Sahlbergella singularis*, Hagl., *S. theobroma*, Dist., and a species of *Helopeltis*,

here recorded as *H. bergrothi*, Reut., which was first found attacking the shoots and pods of cacao in Southern Nigeria in 1939. The identity of the species of *Helopeltis* that occur in West Africa is discussed. Orange and red Capsids collected on cotton in Southern Nigeria in 1925 were identified as *H. bergrothi* and *H. sanguineus*, Popp., respectively, but H. Hargreaves, who received examples of both Capsids from the author in 1934 and apparently bred out series of adults, considered them both to be forms of *H. bergrothi*. During the last twelve years *Helopeltis* has become one of the most important pests of cotton in Southern Nigeria, and orange males and red females have been observed pairing in the field. G. S. Cotterell recorded *H. bergrothi* on cotton in British Togoland in 1928, but in 1935 he informed the author that the species had recently been identified as *H. labaumei*, Popp. J. V. Leroy recorded *H. bergrothi* from cotton in the Belgian Congo and gave coloured illustrations of the adults, nymphs and eggs. Coloured illustrations of the same stages of *H. bergrothi* on cacao in the Gold Coast, where it is a well-known pest of this plant, were given by Cotterell in a paper, and from a comparison of these two series of illustrations the author considers that they represent distinct species. The species found on cacao by the author in 1937 differed from the one attacking cotton there, and the nymphs resembled, although the adults differed from, those on cacao in the Gold Coast illustrated by Cotterell. It was subsequently identified as *H. bergrothi*, but in the author's opinion it is distinct from the species on cotton in Nigeria and the Belgian Congo, which he believes to be identical.

146. Nyasaland: Report of the Entomologist, 1940. By C. Smee. (*Rev. App. Ent.*, xxix., Ser. A, **11**, 1941, p. 588.) In 1940 small numbers of *Platyedra gossypiella*, Saund., were found on cotton throughout the Shire River valley in the Nyasaland Protectorate, and attention is again drawn to the necessity for a dead season between crops to control this pest. No diapausing larvæ have been found between double seeds, but a few were observed to diapause for three to four months in sealed cocoons formed in the lint among seed cotton. The Braconid parasite, *Microbracon kirkpatricki*, Wlkn., appears to be fairly well established in the Lower Shire district. *Apanteles diparopsidis*, Lyle, was observed parasitizing small larvæ of *Diparopsis castanea*, Hmps., on late bolls towards the middle and end of the season, but gave insignificant control. *Mesochorus ornatus*, Wlkn., was reared from a species of *Rhogas* parasitizing larvæ of *Earias* on cotton.

147. Pests of Cotton in Peru, 1939. By J. E. Wille. (*Mem. de la Estac. Exp. Agr. de La Molina*, 1939. From *Rev. App. Ent.*, xxix., Ser. A, **10**, 1941, p. 509.) *Mescinia peruella*, Schaus, caused considerable injury in autumn to the bolls of late cotton. Infestation was most serious in districts having a damp climate, and least so at high altitudes. *Heliothis virescens*, F., continued to spread on cotton. The eggs are laid principally on the young leaves of the terminal shoots, and the larvæ migrate to the buds and bolls, feeding very little on the leaves, except on young plants on which buds have not yet been formed. Pupation occurs in the soil. Some of the autumn pupæ hibernate, but others give rise to adults during the winter. The chief food plant at this season is chick pea (*Cicer arietinum*), but the larvæ also occur on cotton when it is present. Trap crops of chick pea afford the best means of control; other measures are cultivation of the soil to destroy the pupæ and the use of a dust of equal parts of calcium arsenate and sulphur on young cotton. It is emphasized, however, that the best prospect of control lies in the abandonment of ratoon cultivation and the establishment of a close season, possibly in June and July, accompanied by rigorous field sanitation. Infestation of cotton by *Dysdercus ruficollis*, L., was light at the beginning of the year, following very sunny weather at the end

of 1938. Migration to wild food plants began in July, and development was favoured by the mild winter. Parasitism by the Tachinids, *Acaulona peruviana* Tns., and *Paraphorantha peruviana*, Tns., was high in September. The stainers returned in numbers to cotton in October, but the infestation gradually diminished in November except in one valley, in which it continued until the end of the year. This diminution was due to sunny weather and parasitism by the Tachinids, which reached 50 per cent. Infestation by *Anthonomus vestitus*, Boh., was not serious, and in July 90 per cent. of the larvæ were parasitized by the Braconid, *Triaspis vestiticida*, Vier. Damage was caused to cotton in various localities by *Anomis luridula*, Gn. (*texana*, Riley); parasitism of the larvæ by *Eucelatoria australis*, Tns., was high locally and exceeded 60 per cent. in March in one valley. The failure of dusts of calcium arsenate to give control was attributed to the lateness of the treatments and to insufficient rates of application for the heavy populations present. Infestation of the new crop occurred at the end of the year, but 80 per cent. of the larvæ were parasitized by *E. australis* in one valley. In laboratory experiments by F. F. Bibby, two dusts of cryolite and sulphur (1 : 4 and 1 : 1) gave 90 per cent. mortality of the larvæ in 5 and 9 days respectively, whereas the calcium arsenate dust usually employed against them killed 95 per cent. in 24 hours and 100 per cent. in 48. Observations on parasitism showed that *E. australis*, which also attacked *Alabama argillacea*, Hb., was most active in the valleys of central Peru. Further north, the commonest parasite of *Anomis* was a species of *Rhogas*, while in some districts up to 15 per cent. of the larvæ were parasitized by a Braconid probably belonging to the genus *Microbracon*.

A brief account is given of investigations showing that a leaf-curl of cotton first observed in the Huaura Valley in 1938 was most probably caused by the feeding of an undescribed jassid of the genus *Empoasca* that had not previously been observed to cause economic injury. In experiments on control, a sulphur dust killed or repelled over 70 per cent. of the jassids and gave better control than several other dusts and sprays. A form of leaf-curl in the Piura Valley was caused by another jassid, *Oncometopia minor*, Osb., and one that appeared in October in the Cañete Valley was associated with the Coccinellid, *Psyllobora luctuosa*, Muls., which apparently attacked the leaves in the absence of aphids, on which it is predaceous. Other pests of cotton included *Leucothrips theobromæ*, Priesn., *Aphis gossypii*, Glov., *Eriophyes gossypii*, Banks, *Pseudococcus* sp., which injured the bolls in damp fields, and *Lasioderma serricorne*, F., which was favoured by high temperature, and attacked seed cotton just before it was harvested.

148. Cotton Pests in the Philippines. By F. Q. Otanes and F. L. Butac. (*Philipp. J. Agr.*, **10**, 4, 1939. From *Rev. App. Ent.*, xxix., Ser. A, **12**, 1941, p. 648.) A revision of a previous paper. Spraying with soap solution is recommended against sucking insects and mites (*Tetranychus* sp.). When applied against *Aphis gossypii*, Glov., *Ferrisiana* (*Ferrisia*) *virgata*, Ckll., and *Empoasca flavescens*, F., the spray should be directed to the lower surfaces of the leaves to ensure thorough wetting of the insects. Control measures against *Pempherulus* (*Pempheres*) *affinis*, Faust, include hand-picking of adults in the early morning, prompt removal and burning of infested stems and, if the attack is severe, the burning of the whole plant. Hand-picking of larvæ and spraying with soap solution or calcium arsenate are suggested for the control of *Sylepta derogata*, F. The species of *Homona* and *Bemisia* previously recorded have been identified as *H. phanæa*, Meyr., and *B. inconspicua*, Quaint, and one of the species of thrips as *Bussothrips claratibia*, Moult. Insects observed in small numbers on cotton and considered of minor importance are *Dysdercus pœcilus*, H.-S., *Tectocoris diophthalmus*, Thnd. (*lineola*, F.) *Saissetia coffeæ*, Wlk.,

(*hemisphœrica*, Targ.), *Nezara viridula*, L.; *Drosicha townsendi*, Ckll., *Ricania speculum*, Wlk., *Dictyophora* sp., *Phaneroptera furcifera*, Stal, and *Prodenia litura*, F.

[*Cf.* Abstrs. **282**, **472**, and **642**, Vol. XIII. of this Review.]

149. Russia: Results of the Work of the Laboratory of Biological Control at the Institute for Plant Protection. By N. F. Meier. (*Summ. of Sci. Res. Work of the Inst. of Pl. Prot.*, Leningrad, 1939. From *Rev. App. Ent.*, xxix., Ser. A, **11**, 1941, p. 581.) Work by Livshitz on the aphids that infest cotton in the district of Anapa on the Black Sea showed that an infestation is not evenly distributed throughout the field. A decrease in the abundance of the aphids in summer was due not to the dry hot weather, but to the activity of parasites, of which *Aphidius cardui*, Marsh., was the most important, and predaceous Coccinellids, of which *Coccinella septempunctata*, L., and *Adonia variegata*, Gze., were the commonest. *Propylœa quatuordecimpunctata*, L., was less frequent.

150. Thailand: Cotton Pests. By L. Jotisalikara. (*Ann. Rpt. Cott. Exp. Sta. Klongtan, Swankaloke, Thailand*, 1937-38. From *Rev. App. Ent.*, xxx., Ser. A, **1**, 1942, p. 6.) Cotton pests were more prevalent during 1937-38 than in the previous season. A weevil of the genus *Amorphoidea* infested the flowers and apparently caused extensive shedding of the young bolls, and *Platyedra gossypiella*, Saund., destroyed a large proportion of the bolls of all stages. *Sylepta derogata*, F., and *Pempherulus* (*Pempheres*) *affinis*, Faust., occurred in small numbers, the latter attacking cotton that was planted early. The maximum, minimum, and average periods required for the development of the various stages of *P. gossypiella* and *S. derogata* and the number of eggs laid by females of the latter are shown in tables. American varieties were in general freer from insect attack than Cambodia varieties, but jassids were troublesome on them.

151. Cotton Root Aphids: Control. By C. F. Rainwater. (*U.S. Dpt. Agr., Bur. Ent. Pl. Quarantine*, E. 533, March, 1941. From *Summ. Curr. Lit.*, xxi., **21**, 1941, p. 515.) Cotton roots are attacked by white, green, and brown aphids, and the best means of checking them is to place a poison bait containing tartar emetic at intervals of about 10 feet in the rows just as the cotton is beginning to sprout. Particulars are given.

152. Le Charançon du Cotonnier en Haiti. By A. Audant. (*Bull. Serv. Nat. Prod., Agr. Enseign. Rur. Haiti*, **16**, 1938, p. 64. From *Pl. Bre. Absts.*, xii., **1**, 1942, p. 59.) A series of plot experiments were carried out to determine whether certain indigenous perennial cottons of Haiti were resistant to *Anthonomus grandis*, Boh., as had been claimed for them. Annual cottons were used as controls. Though no definite conclusion is drawn about the point at issue, it appears that the indigenous cotton has the following advantages over the annual type: it is much more resistant to the pink bollworm and mosaic, and is more hardy, thriving where more delicate forms would not grow. It is suggested that the indigenous cottons could be improved by selection for earliness, and some promising types for such improvement have already been found.

[*Cf.* Abstr. **117**, Vol. XV. of this Review.]

153. Investigations on the Control of Cotton Insects. By F. F. Bondy and C. F. Rainwater. (*53rd Rpt. S. Car.*, 1939-40. From *Rev. App. Ent.*, xxx., Ser. A, **1**, 1942, p. 43.) The development since 1923 of work on the control of *Anthonomus grandis*, Boh., on cotton in South Carolina is briefly reviewed. Experiments during 1928-40 showed that the most effective and profitable single treatment is dusting with calcium arsenate at five-day intervals, beginning when 10 per cent. of the squares become infested. The chief objections to this treatment

are that it is expensive and requires special dusting apparatus, that it is often followed by infestation by leaf aphids (*Aphis gossypii*, Glov.), and that it may cause injury to subsequent crops. In South Carolina, however, no case of soil injury has been observed by the authors during several years of investigations. Tests in South Carolina and Mississippi to determine the amounts of calcium arsenate that would cause injury on different types of soil have shown that 200 lb. per acre on light sandy soils results in some injury to cowpeas, but that cotton is not damaged until 400 lb. is applied. On heavier soils, 1,600 lb. per acre caused no damage to cotton. Ordinarily, not more than 40 lb. calcium arsenate per acre would be needed per year for weevil control, and it is considered that the risk of consequent soil injury has been greatly exaggerated.

In an attempt to prevent leaf aphids from increasing to injurious numbers, experiments were carried out on the use of mixtures of calcium arsenate with equal parts of hydrated lime or sulphur. The mixture with lime, applied at the rate of 6-8 lb. per acre, did not cause so large an increase of aphids and gave satisfactory control of the weevil, but in some years there was still some aphid injury following its use. In 1939, 0·5 per cent. nicotine was added to this mixture, and enough derris or cubé to give a rotenone content of 0·5 per cent. was added to mixtures of calcium arsenate and equal parts of sulphur or diatomaceous earth. All these combinations were effective in preventing aphid injury, but rotenone was superior to nicotine. These results were confirmed in 1940, when plots that received undiluted calcium arsenate with 0·5 per cent. rotenone were only slightly more infested by aphids than the controls, and plots receiving calcium arsenate alone were heavily infested. Those treated with mixtures of calcium arsenate and sulphur or diatomaceous earth with rotenone were less heavily infested than the controls.

[*Cf.* Abstr. **142,** Vol. XVIII. of this Review.]

154. Further Studies of Various Insecticides against Three Cotton Insects. By G. L. Smith *et al.* (*J. Econ. Ent.*, **34,** 2, 1941, p. 310. From *Exp. Sta. Rec.*, **85,** 4, 1941, p. 504.) Cage tests conducted at Tallulah, La., in 1939, in which several arsenicals and cryolites were used against the boll weevil and the cotton leafworm, and derris, pyrethrum, sulphur, and calcium arsenate-sulphur mixtures against the tarnished plant bug, are reported. " With calcium arsenates that had been separated into fractions according to particle size, definite correlations were shown between particle size and percentage of water-soluble arsenic pentoxide as determined by the New York method, between particle size and net boll weevil mortality, and between percentage of water-soluble arsenic pentoxide and net mortality. Calcium arsenate was more effective against the boll weevil and the cotton leafworm than cryolite, with or without wetting agents. Dicalcium arsenate gave better results than commercial calcium arsenates, calcium arsenate-sulphur mixtures, or basic copper arsenate. The addition of wetting agents to calcium arsenate and to cryolite did not significantly affect mortality. Calcium carbonate and sulphur appeared to be better carriers for calcium arsenate than lime. Against adults of the tarnished plant bug, calcium arsenate-sulphur mixtures caused a higher mortality than sulphur alone. There was no significant difference in effectiveness between derris and pyrethrum, but both were more effective than calcium arsenate-sulphur mixtures."

[*Cf.* Abstrs. **324,** Vol. XV.; **681,** Vol. XVI.; and **133,** Vol. XVIII of this Review.]

155. Insecticide Tests on the Bollworm, Boll Weevil, and Cotton Leafworm in 1940. By R. W. Moreland *et al.* (*J. Econ. Ent.*, **34,** 4, 1941, p. 508. From *Exp. Sta. Rec.*, **86,** 1, 1942, p. 67.) Cage toxicity tests carried

out in Texas indicated that when bollworm larvæ were arranged into four weight groups it was found that in general mortalities due to insecticides varied inversely with the weight of the larvæ. A mixture of basic copper arsenate and lime killed a slightly higher percentage of large worms (over 45 mg.) than calcium arsenate killed of small worms (under 15 mg.). Against bollworm larvæ of all weight groups the average mortality after 120 hours was 91·8 per cent. from the basic copper arsenate and lime mixture, 87·9 per cent. from lead arsenate, 83·7 per cent. from undiluted basic copper arsenate, 82·7 per cent. from cryolite containing 66·1 per cent. sodium fluoaluminate, and 62·3 per cent. from calcium arsenate. Basic copper arsenate was more effective against bollweevil and leafworm than calcium arsenate.

156. Cryolite and Cryolite-Sulphur Mixtutes for Boll Weevil Control and their Effect on the Cotton Aphid. By F. L. McGarr. (*J. Econ. Ent.*, **34**, 4, 1941, p. 500. From *Exp. Sta. Rec.*, **86**, 1, 1942, p. 67.) The results of tests conducted at State College, Mississippi, indicated that cryolite-sulphur mixtures containing sodium fluoaluminate gave little or no control of boll weevil, and cryolite alone was only half as effective as calcium arsenate. With the cryolite-sulphur mixtures the aphid population increased in proportion to the sodium fluoaluminate.

[*Cf.* Abstr. **145**, Vol. XVIII. of this Review.]

157. Cotton Bollworm: Natural Control of Eggs and First Instar Larvæ. By R. K. Fletcher. (*53rd Ann. Rpt. Texas Agr. Exp. Sta.*, 1940, p. 55.) Observations made on 378 eggs laid on cotton plants indicated that 40 per cent. of these eggs hatched, 17 per cent. were destroyed by the predaceous sucking insect *Orius insidiosus*, 15 per cent. by the egg parasite *Trichogramma minutum*, 19 per cent. were knocked from plants by cultivation or wind, and 8 per cent. were unaccounted for. Two hundred and seven first instar larvæ were studied on the cotton plants: 68 per cent. were killed by *O. insidiosus*, 7 per cent. by spiders, 25 per cent. bored into small squares or bolls or were inside the bracts at last observation, 28 per cent. dropped or were blown from plants, and 7 per cent. were unaccounted for.

158. Insecticide Tests for Bollworm Control during 1940. By J. C. Gaines. (*J. Econ. Ent.*, **34**, 4, 1941, p. 515. From *Exp. Sta. Rec.*, **86**, 1, 1942, p. 66.) Two experiments for bollworm control conducted at College Station, Texas, are reported. Comparison was made of the effectiveness of synthetic and natural cryolite, lead arsenate, commercial calcium arsenate, and a special calcium arsenate containing a high percentage of water-soluble arsenic pentoxide. Records of the infestations of weevils, rapid plant bugs, and aphids that developed on the plats made it possible to obtain some information on the action of the insecticides on these pests also. Lead arsenate and natural cryolite-sulphur (85-15) gave better control of the bollworm than the calcium arsenates or synthetic cryolite-sulphur (85-15). All arsenicals were more effective against the weevils than the cryolite. The arsenicals containing the highest percentage of water-soluble arsenic pentoxide caused the largest increases in aphids, but gave the best control of the rapid plant bugs. In general the plats treated with arsenicals yielded more cotton than the plats treated with cryolites, because the cryolites did not give adequate control of the boll weevil.

[*Cf.* Abstrs. **154** and **393**, Vol. XVIII. of this Review.]

159. Descripción de Una Especie Nueva del Género *Conotrachelus*, Sch. (Col. Curculionidæ). By A. Hustache. (*Notas Mus. La Plata*, **4**, Zool. No. 23, Buenos Aires, 1939. With French summary. From *Rev. App. Ent.*, xxix., Ser. A, **9**, 1941, p. 445.) Descriptions are given of the adults of both

sexes of *Conotrachelus denieri*, sp.n., taken in eastern Formosa, Argentina, in July, 1939. In supplementary notes, P. C. L. Denier states that the weevils were taken on wild plants close to cultivated cotton. He has received examples from cotton in Concepcion, Paraguay, where the larvæ sometimes destroy the entire crop. The females oviposit in the green fruits; the larvæ feed in the bolls and have been observed to pupate in them, though it is considered that they normally do so in the soil. Bolls formed as early as October are attacked, and infested ones turn brown and fall.

160. Cotton Flea Hopper: Host Relation. By E. Hinson. (*Iowa State Coll. J. Sci.*, **16**, 1941, p. 66. From *Summ. Curr. Lit.*, xxii., **3**, 1942, p. 56.) The cotton flea hopper, *Psallus seriatus*, Reut., occurs in 22 of the United States. The cotton plant is injured by the feeding of the adults and nymphs which pierce the tissue of the growing tip and suck the sap, causing death and shedding of the small squares. The plant responds to the injury either by making a whip-like growth with scarcely any branches, or a rank vegetative growth, in both cases being devoid of squares and blooms. The flea hopper feeds on 138 species of plants which are distributed in 28 families, the most important of which are *Œnothera, Monarda, Solanum* and *Croton*. The distribution of the host plants, their seasonal classification, and observations of the feeding of nymphs and adults on them are discussed. The population of flea hoppers in cotton is never as large as in the weed hosts. Probably the easiest method of control would be to mow all infested areas and encourage grasses to grow.

161. Fruiting of Cotton in Relation to Cotton Flea Hopper and Other Insects which do Similar Damage to Squares. By A. L. Hamner. (*Miss. Sta. Bull.* 360, 1941. From *Exp. Sta. Rec.*, **86**, 1, 1942, p. 68.) The complete loss of young squares through the third week in July failed to cause significant losses in the yield of seed cotton where the fruit was protected from boll weevil and other insects and disease was negligible. Plats which had the squares removed for more than two weeks produced cotton with a staple length about 1/32 inch shorter than check plats. Sulphur dust at the rate of 10 lb. per acre is effective against the flea hopper, and two applications should be sufficient for the purpose.

162. Contribucion al Concimiento de Algunos Enemigos Naturales de la Oruga de la Hoja del Algodonero (*Alabama argillacea*, Hübn.) By G. A. Kreibohm de la Vega. (*Rev. Indus. y Agr.*, **30**, 7-9, pp. 163-171, Tucuman, Argentina, 1940. From *Cott. Lit.*, March, 1941, p. 224.) A contribution to the knowledge of some natural enemies of the cotton leafworm (*Alabama argillacea*).

163. The Bionomics of *Empoasca devastans*, Distant, on some Varieties of Cotton in the Punjab. By M. A. Husain and K. B. Lal. (*Ind. J. Ent.*, **2**, 2, 1940, p. 123. From *Rev. App. Ent.*, xxix., Ser. A, **10**, 1941, p. 516.) An account of the observations on the bionomics of *Empoasca devastans*, Dist., carried out at Lyallpur in 1935-37 in view of the increasing damage it has caused to cotton in the Punjab during the last 25 years. All stages of this jassid are described, and a list is given of 17 species of *Empoasca* that have been recorded on cotton in various parts of the world. Other plants on which *E. devastans* was observed breeding at Lyallpur were hollyhock, castor, egg-plant, potato, *Hibiscus esculentus*, and *H. vitifolius*, the last two being much favoured. Eggs are laid in the leaf veins and hatch in 4-11 days. The maximum number of eggs deposited by one female was 29, but females in captivity usually laid only about 15. The duration of the nymphal stage ranges from 7 days in autumn to 21 days in winter, and the nymphs feed on the leaves, at first near the bases of the veins and later over the whole of the lower surfaces. Unmated adults

survived for more than 3 months, but mated examples did not live longer than 5 weeks in summer and 7 in winter. Breeding occurs throughout the year at Lyallpur, except possibly from late January to late March. In early spring eggs are deposited on hollyhock, egg-plant and potato, and infestation spreads from these to ratoon cotton and *H. esculentus*. Cotton seedlings are attacked at the end of June, and from then onwards *H. esculentus* and American cotton are heavily infested. About the beginning of November the population declines on cotton and *H. esculentus*, and a little later on *H. vitifolius*, but increases on potato, hollyhock, and egg-plant, which are the chief winter food plants. Eleven generations, lasting 15-46 days, were observed in a year, but there is considerable overlapping.

Cotton is usually most susceptible to attack in the preflowering stage, which occurs in the Punjab when it is 8-10 weeks old. Both nymphs and adults injure the plants chiefly by injecting toxic saliva into the tissues; there is no evidence that they transmit any virus to the plants. On varieties that are resistant to attack the first symptoms are a wilting of the leaf, followed by the drying up of the apex and periphery, which become brown and necrotic. On susceptible varieties there is a general mottling and curling of the leaf, and later in both the leaf assumes a brick-red colour with strips of yellowish-green along the principal veins. In the Punjab the native cottons are more or less resistant, while American cottons are in general susceptible, though there is considerable local variation. Investigations on the factors conferring resistance showed that nymphs of all instars are able to feed and develop on both susceptible and resistant, hairy and non-hairy varieties of cotton, that there is no reduction in fertility in adults from nymphs reared on resistant plants, but that there is marked reduction in oviposition (or possibly hatching) on resistant varieties. Further investigations showed that, other conditions being equal, early sown cotton is less liable to attack; that maximum infestation occurs immediately preceding bud formation; that various manurial and irrigation treatments did not affect the incidence of the jassid; that there was no apparent correlation between the *p*H of the leaf sap and susceptibility to attack; and that while nearly all resistant varieties of cotton are hairy, not all hairy varieties are resistant.

In investigations in the Punjab on control, catching the adults with hand nets was found impracticable on a large scale, and light-traps were ineffective. Dusting with a mixture of calcium cyanide and wood ash (1 : 8) gave over 90 per cent. mortality, but was expensive, while spraying with resin soap and with resin compound (resin and sodium carbonate) was successful on a small scale; sprays containing nicotine have given good results against adults and nymphs in Madras. No parasites have been recorded from *E. devastans*, and little control is afforded by predators (ants and spiders). The development of resistant varieties of cotton offers the greatest promise of control.

164. Primeiros Resultados das Experiencias de Combate à Broca do Algodoeiro *Gasterocercodes brasiliensis*, Hambl. (Col. Curcul.), por Meio de Pulverizações com Caldas Arsenicais. By H. F. G. Sauer. (*Arq. Inst. Biol.* 11, p. 499, São Paulo, Brazil, 1940. Summary in English. From *Rev. App. Ent.*, xxix., Ser. A, **12**, 1941, p. 623.) An account is given of investigations in São Paulo, Brazil, on the life-history and control of *Gasterocercodes brasiliensis*, Hambl., which is an important pest of cotton and is not satisfactorily controlled by the methods hitherto recommended. Observations have shown that at the time of picking almost all the cotton plants are infested by this weevil. Large numbers of the adults survive the winter in spite of cultural measures, and are attracted in spring to the new cotton fields. Those planted early are attacked

first, and as their area is comparatively small the infestation is heavy and the young plants are severely injured or even destroyed. One early-planted field had an infestation of 95 per cent. 3 months after planting, and about 50 per cent. of the plants were killed. The spread of infestation is difficult to explain on the assumption that the adults migrate by crawling. They are active only at night, which renders observation difficult, but the author has shown that they are able to fly. At first the overwintered adults feed on any part of the young plant, but in older ones the region of the root collar is preferred for feeding and oviposition. Oviposition begins when the plants are about 3-4 inches high. During the preoviposition period of about 5 days the adults feed on the leaves and bark, with a marked preference for the lower part of the stem. From October to March, when temperature and humidity are highest, development from egg to adult emergence from the stalks takes about 72 days, the first generation requiring less than the second.

In view of work by Pyenson, experiments were carried out on the value of arsenical sprays against the adults, and the results are given in detail in a series of tables. The insecticides tested in the laboratory were arsenates of calcium, lead, and aluminium, containing 40·18, 32·2, and 27·6 per cent. As_2O_5 respectively. They all reduced the amount of feeding on sprayed plants and gave considerable mortality. They were effective in the order given, but aluminium arsenate was much inferior to the others. The females appeared to feed more than the males, but mortality was about equal. A spray of 0·5 per cent. calcium arsenate gave very good results, and these were not improved by increasing the concentration; it was therefore adopted in preliminary field tests on artificially infested plants. The percentage mortalities 5 and 10 days after treatment were 91·7 and 98 respectively, and very similar results were obtained in a second test. In further experiments, in which field plots arranged in a Latin square were artificially infested with weevils, sprays of 0·3 per cent. calcium arsenate, 0·3 per cent. lead arsenate, and 0·25 per cent. Paris green were applied eight times at weekly intervals, beginning on December 2. The results are recorded in tables, giving the proportions of plants infested on various dates and the numbers of all stages of the weevil found on them, and are analyzed statistically. They showed that calcium arsenate and lead arsenate were significantly superior to the controls, and calcium arsenate to Paris green, but the differences between the two arsenates were not significant. Paris green was barely superior to the controls. The differences in effectiveness were to some extent obscured by faulty application in the early part of the experiment and by migration of weevils from the controls to the sprayed plots. In an area of about 21,000 sq. yds., sprayed four times at intervals of 25-30 days with 0·6 per cent. calcium arsenate, starting when the plants were 5-6 inches high, the infestation was 32 per cent. after four months, as compared with about 74 per cent. in a neighbouring unsprayed field. After this date the infestation increased, and at harvest was about equal in the two areas. The population in the sprayed field, however, consisted chiefly of young individuals, and there was little deformation of the stalks. The growth of the plants was far better, and there seemed to be less shedding in the treated area. The correct dates for spraying have not been determined, but the applications should begin when the plants are only a few inches high; the first spray should cover the entire plant, but the others only the lower part.

165. COTTON JASSIDS AND THEIR CONTROL. By K. B. Lal. (*Ind. Frmg.*, September, 1941, p. 465.) An account of the life-history and habits of cotton jassids and the nature and extent of the injury caused by them. Cotton jassids are especially serious in East, West, and South Africa, and in the Punjab, Sind,

and Madras. Control measures suggested are spraying the cotton plants with rosin compound, pyrethrum, or other contact insecticides, or by dusting with nicotine or calcium cyanide. Destruction of alternative host plants is not recommended, since certain of these plants are of good economic value. In North-West India several species of spider prey on the nymphs and adults of cotton jassids, but are not effective in controlling the pest. No insect parasite of cotton jassids appears to be known. For future work on the problem the author suggests the following: A study of the physical and chemical characteristics of the leaf veins in the resistant and susceptible cotton varieties to determine what it is that makes some veins unsuitable for egg-laying by jassids. In addition, the effect of such environmental factors as temperature, rainfall, presence or absence of host plants other than cotton, which undoubtedly influence jassid multiplication, should be studied. The seasonal population of jassids on cotton and other host plants, and the causes of their fluctuation, not only from season to season but from year to year, should also be investigated.

166. GEORGIA: COTTON PESTS, 1941. (*Ann. Rpt. Ga. Exp. Sta.*, 1940-41, p. 118.) In May, 1941, there was an outbreak of the pale-striped flea beetle, *Systena blanda*, Mels., in the Piedmont region. The principal crop attacked was cotton, but some damage was also suffered by peppers and beans. Most of the feeding was on the cotyledonary leaves, the beetle chewing off small patches on both surfaces. Quite a number of plants were killed by the beetles, but usually not enough to affect the stand. Outbreaks in Georgia have always been associated with long periods of dry weather in winter and spring.

167. BIOLOGY OF THE COTTON STEM WEEVIL, *Pempherulus affinis*, FST., UNDER CONTROLLED PHYSICAL CONDITIONS. By P. N. Krishna Ayyar and V. Margabandhu. (*Bull. Ent. Res.*, 32, 1, 1941. From *Rev. App. Ent.*, xxix., Ser. A, 10, 1941, p. 515.) The following is based on the authors' discussion and summary of the results of laboratory studies on the physical conditions affecting the adult longevity, oviposition and immature stages of *Pempherulus affinis*, Faust, on cotton that were begun in India in 1937. A technique for evaluating the effects of temperature and relative humidity was developed and is described. The upper vital temperature limit for adults is about 100° F., and the upper thermal death point about 122° F., an exposure of 6 hours being needed for mortality at that temperature and one of 48 hours at 113° F. Above 100° F. variations in humidity have no effect on longevity. Adult longevity increased from 6 hours to 98 days as the temperature was lowered from 122° to 91° F., and reached its maximum, with oviposition, at 91° F. and a relative humidity of 73 per cent. At normal temperatures (about 93° F.), a high degree of humidity (60-80 per cent.) is necessary for maximum adult longevity. Within vital limits, the optimum humidity varies directly with the temperature, lying between 60 and 80 per cent. at 90° F. and between 80 and 100 per cent. at 100° F. The upper temperature limit for oviposition is about 113° F., but those for hatching and embryonic development are somewhat below and near 100° F. respectively. Oviposition occurred at a wide range of humidities; the optimum for it varied between 80 and 100 per cent. at 100° F., and between 60 and 80 per cent. at 93° F.; at 91° F. it was about 73 per cent. The incubation period was only slightly affected by variations in humidity at normal temperatures; the optimum for hatching and survival of the larvæ was 100 per cent., although hatching, which at 60 per cent. was only partial, was complete at 80 per cent. The greatest mortality occurs in the egg and early larval stages, which are very sensitive to desiccation. Some prepupæ and pupæ can develop in humidities as low as 0-40 per cent., but one of 100 per cent. is unfavourable, owing to fungous growth. The rate of development of mature larvæ, prepupæ, and pupæ varied inversely

with the humidity; at 93° F. and 100 per cent. the life-cycle occupied 66 days, whereas, when the mature larvæ were transferred from 100 to 60 per cent., it occupied only 52. The occurrence of *P. affinis* only in irrigated crops can be attributed to its high requirement of moisture and not to varietal preferences, and its distribution is confined to districts where moist, humid conditions prevail.

168. Factors influencing the Formation of Resting Pink Bollworm Larvæ. By A. J. Chapman and M. H. Hughs. (*J. Econ. Ent.*, **34**, 4, 1941, p. 493. From *Exp. Sta. Rec.*, **86**, 1, 1942, p. 74.) Experiments with larvæ overwintering in bolls as well as in cocoons in the soil or on the surface of the soil were conducted at Presidio, Texas, to determine some of the factors conducive to the development of resting larvæ. The findings emphasize the importance of early maturity of the cotton crop, combined with early field clean-up in areas where practicable, in reducing the number of pink bollworm entering the resting stage.

169. Control of Pink Bollworm with Insecticides. By A. J. Chapman and W. L. Lowry. (*J. Econ. Ent.*, **34**, 4, 1941, p. 490. From *Exp. Sta. Rec.*, **86**, 1, 1942, p. 74.) Tests carried out at Presidio, Texas, indicate that fluorine compounds, particularly cryolite, give the best control when applied as sprays or dusts.

170. La "Lagarta Rosada" del Algodonero (*Pectinophora gossypiella*, Saunders). By K. J. Hayward. (*Circ. Estac. Exp. Agr., Tucuman*, No. 93, 1940. From *Rev. App. Ent.*, xxix., Ser. A, **10**, 1941, p. 498.) A brief account is given of the bionomics, distribution and control of *Platyedra* (*Pectinophora*) *gossypiella*, Saund. This Tineid already occurs in Argentina, but has not yet spread to the Province of Tucuman, where much cotton is grown. Unceasing vigilance will be needed to prevent its entry.

171. Apuntes Sobre Insectos que Pueden ser de Interes para la Agricultura Argentina. By J. M. Bosq. (*Rev. Chil. Hist. Nat.*, **43**, Santiago, 1940, p. 49. From *Rev. App. Ent.*, xxix., Ser. A, **10**, 1941, p. 512.) These notes include a record of an example of *Prionobrachium fuscum*, Hust., on cotton in Tucuman; this weevil usually develops in the fruits of *Abutilon*.

172. Studies on *Pyrausta nubilalis*, Hübner, attacking the Cotton Plant. By M. Koo. (In Japanese.) (Kofu, Yamanashi Agr. Exp. Sta., 1940. From *Rev. App. Ent.*, xxx., Ser. A, **1**, 1942, p. 15.) In Yamanashi Prefecture, Honshu, cotton is attacked by *Pyrausta nubilalis*, Hb., which has three overlapping generations a year, the adults emerging from late May to early October. The overwintered larvæ pupate from mid-May to late June, mostly in late May. The females are somewhat more numerous than the males, and represented 65·7 per cent. of the adults taken in a light-trap. Females lived for up to 17·6 days and males for up to 8. Oviposition began 2-4 days after emergence and continued for 2-10 days, most eggs being laid on the first day. The average and maximum numbers of eggs laid per female were 134·7 and 564, a single mass containing 26-32 eggs; 88·9 per cent. of the eggs were found on the lower surfaces of cotton leaves. Oviposition occurs on cotton from late June to early October, mostly from late August onwards. Injury to cotton is conspicuous from late July to mid-October and is serious in September. The larvæ hatched in 3-5 days and bored into the plants about 6 days later; the larval stage averaged 31·4 days in spring and 19·3 days in summer, and the pupal stage lasted 6-19 days. The larvæ entered hibernation from early September to late October, but only 10 per cent. of the overwintering population reached the adult stage, owing to heavy mortality from early March onwards. About 88 per cent. of the hibernating larvæ were found among fallen leaves and in cotton stalks. This

Pyralid attacks several other plants in Yamanashi Prefecture, where hemp and *Sorghum* received more eggs and suffered greater injury than maize. Over 96 per cent. of the eggs are sometimes parasitized by *Trichogramma* spp. The Tachinid, *Ceromasia senilis*, Mg., parasitizes the larvæ, while the predaceous Anthocorid, *Orius* (*Triphleps*) *sauteri*, Popp., destroys the eggs and the young larvæ before they enter the plants, and the Carabid, *Chlaenius pictus*, Chaud., also feeds on the larvæ. Sprays of Bordeaux mixture or a proprietary derris preparation did not prevent oviposition, and although dusting with tobacco decreased it and the subsequent injury, it increased the dropping of the buds and bolls. Spraying with lead arsenate decreased injury, and calcium arsenate also gave promising results.

173. Rapid Plant Bug: Control. By J. C. Gaines. (*53rd Ann. Rpt. Texas Agr. Exp. Sta.*, 1940, p. 57.) Populations of the rapid plant bug (*Adelphocoris rapidus*, Say) develop late in the season and have been found capable of causing some injury to cotton. Experiments indicated that calcium arsenate with a high percentage of water-soluble arsenic pentoxide gave control of the pest, while a mixture of sulphur and commercial calcium arsenate (2-1) gave a 39 per cent. control.

174. Entomological Progress—II. By C. O. Eddy. (*Bull. Agr. Exp. Sta., La.*, No. 323, Baton Rouge, La., 1940. From *Rev. App. Ent.*, xxix., Ser. A, 12, 1941, p. 599.) It is stated that considerable injury is caused by the sand wireworm, *Horistonotus uhleri*, Horn, to cotton, maize, cowpeas, most vegetable crops, and some grasses from time to time in Louisiana. The eggs are laid in June and July, and the larvæ, which hatch in about 12 days, feed on the roots and underground parts of the plant and give rise to adults in the following May-July. The greatest damage is caused by the larvæ approaching maturity in May and June. Observations in Louisiana have shown that soy beans, planted early, are the most practical crop to use in the one-year rotation programme required to control or eliminate this Elaterid from soil in which its preferred food plants have been growing. Leaving infested land fallow for one year is almost as effective, but has not the same agricultural advantages. The velvet bean (*Stizolobium*) and kudzu (*Pueraria hirsuta*) are also favourable crops for rotation, but are less desirable. An effective rotation in preliminary tests was to follow infested cotton or maize with winter oats planted in autumn, and then with summer sagrain (a grain-producing sorghum with a sweet stalk) planted not earlier than July 10. In some instances the addition of large amounts of organic matter as manure gave adequate control.

175. On the Biology of *Dysdercus howardi*, Ballou. II. The Effect of Continued Inbreeding on the Life-History. By E. I. MacGill. (Reprinted from *Bull. Ent. Res.*, 23, 3, 1941.) A number of generations of *Dysdercus howardi*, Ballou, bred in the laboratory between 1932 and 1934 are compared with a similar number of generations bred from 1940 to 1941. There is found to be no significant difference in the length of the life-cycle in the two periods. There is a significantly greater number of adult female insects in the earlier generations of *D. howardi* (eleven generations). In the later generations there is a high percentage of infertile eggs. The difference between the two groups of insects is highly significant. There is no significant difference in the percentages of nymphs becoming adult in the two periods. The differences in the numbers of adult insects and in the sex ratios obtained in 1932-34 and 1940-41 are found to be non-significant (twelve generations).

[*Cf.* Abstr. 126, Vol. XIII. of this Review.]

176. The Ecology of *Habrobracon brevicornis*, a Parasite of the Larvæ of the Cotton Noctuid, and the Possibility of its Practical Utilization.

By I. S. Skoblo. (*Rpt. of Sci. Mtgs. of Leningrad Inst. Agr.*, Leningrad, 1940. From *Rev. App. Ent.*, xxx., Ser. A, 1, 1942, p. 25.) The author states that in many cotton-growing districts of Azerbaijan considerable numbers of larvæ of *Heliothis armigera*, Hb., are parasitized by *Microbracon* (*Habrobracon*) *brevicornis*, Wesm., and gives an account of laboratory investigations on its bionomics. It completed a generation in 6-9 days at 30° C. (86° F.) and in slightly over 9 days at 28° C. (82·4° F.). The numbers of eggs deposited averaged 300-400, and the absolute maximum was over 800. Other conditions being equal, the number of eggs laid per day depended on the number of larvæ available, and ranged from 5 or less to over 50. Pairing usually took place on the day of emergence, and the eggs deposited by unfertilized females gave rise exclusively to males. Individuals deprived of food, those given water only, and those that fed on the body juices of the larvæ lived for 3, 5, and 7 days respectively at high temperatures. The influence of relative humidity on the longevity of starved adults was marked only at low temperatures; at 13°-15° C. (55·4°-59° F.) and humidities of 0, 75 and 100 per cent., males survived for averages of 17·1, 40·4 and 29·7 days respectively. When supplied with carbohydrates the parasites lived for 50-70 days at 18° C. (64·4° F.) and longer at 13°-15° C., and ovipositing females lived for an average of 26 days at 23°-28° C. (72·4°-82·4° F.). Those prevented from ovipositing lived for an average of 30-35 days, and some for over 50 days at 28-30° C. The females readily inserted the ovipositor into and paralyzed the larvæ of various Lepidoptera, without ovipositing in them; at 28°-30° C. individual females paralyzed 10 or more larvæ of the mill Pyralid (*Ephestia kuehniella*, Zell.) in 24 hours. At 40°-42° C. (104°-107·6° F.) the parasites still actively paralyzed larvæ, but not at 8°-9° C. (46·4°-48·2° F.). In the absence of host larvæ no eggs were laid, and the mature ones in the ovaries degenerated. When supplied with carbohydrates, parasites that did not oviposit lived a long time even at high temperatures, and their ability to do so enables them to survive in the field during periods when no host larvæ are available. Females deprived of host larvæ for 15 days laid eggs in the larvæ soon after they were supplied, and their fertility was increased by almost 50 per cent. Of females prevented from ovipositing for about 30 days, up to 50 per cent. died at 28°-30° C., but the survivors readily attacked larvæ as soon as the latter were supplied. Females a month or more old paired and gave rise to a normal proportion of males and females, but when young females paired with old males the progeny consisted of males only. Parasites that did not oviposit for 15-30 days lived very little longer than those that oviposited from the day of emergence.

All stages of *M. brevicornis* were very resistant to high temperatures irrespective of humidity. Development was normal at 30°-35° C. (86°-95° F.), but was somewhat retarded at 40° C. and about half the pupæ died. The adults showed no signs of torpor at 40°-42° C. The parasite is well adapted to the climatic conditions of Azerbaijan, where the summers are hot and dry, and also to the high humidity that occurs within the immature pods of chick peas and cotton bolls, where parasitized larvæ of *Heliothis* are most often found. The adults are also very resistant to cold and probably overwinter in the field; in one experiment they survived exposure for about 3 months in the open to temperatures that gradually decreased from 6° to − 17° C. (42·8°-1·4° F.), and revived when transferred to warm conditions. The pupæ withstood cooling down to − 7° C. (19·4° F.), and eggs and larvæ that had been kept for about 3 weeks at 6°-2° C. (42·8°-35·6° F.) developed normally. From data on the numbers of eggs, larvæ and pupæ of *Microbracon* found in cotton fields on larvæ of *Heliothis*, and the rapidity of egg maturation, it is estimated that the moth could be controlled by releasing the parasite at the rate of about 4,000 females per acre.

177. A SURVEY OF COTTON SEEDLING DISEASES IN 1941 AND THE FUNGI ASSOCIATED WITH THEM. By P. R. Miller and R. Weindling.[1] (*Pl. Dis. Rptr.*, xxv., **14**, 1941. Mimeographed. From *Rev. App. Mycol.*, xxi., **1**, 1942, p. 14.) During 1941, the fourth consecutive year of the cotton seedling disease survey, *Glomerella gossypii*, once more the predominant pathogen, extended its range slightly to the westward of previous locations in Texas and Oklahoma. *Rhizoctonia* (*Corticium*) *solani* was more generally prevalent than during the past three seasons, the total percentages in the 12 States covered by the survey being: *G. gossypii* 36·4, *Fusarium moniliforme* (*Gibberella fujikuroi*) 39·4, *C. solani* 2·8, *F.* spp. 6·3, *Alternaria* spp. 0·8, *Diplodia gossypina* 0·1, and unidentified species 7·4.
[*Cf.* Abstrs. **306**, **752**, Vol. XVI.; and **175**, **433**, Vol. XVII. of this Review.]

178. DISEASES OF VILLAGE CROPS IN CEYLON. By Malcolm Park and M. Fernando. (*Peradeniya Manuals No. IV.*, Ceylon Govt. Press, Colombo, 1941. Price Rs. 4.) This manual, in addition to providing the student with a grounding in the fundamentals of plant pathology, is intended as a book of reference that will assist him in the diagnosis and control of the commoner disorders of crop plants in Ceylon. Part I. General, deals with the following: The Structure and Behaviour of Fungi; The Invasion of a Plant by a Parasite; Symptoms of Plant Disease. Part II. is concerned with Types of Fungus Diseases. Part III. with Diseases of Village Crops. Part IV. with Plant Protection. Many illustrations are included.

179. COTTON DISEASES IN TEXAS IN 1939. By W. N. Ezekiel and A. A. Dunlap. (*Pl. Dis. Rptr.*, **24**, 1940, p. 434. From *Circ.* 93, Texas Agr. Exp. Sta., 1941, p. 30.) Maps showing the approximate prevalence by counties, and a table giving estimated percentage reductions in yield by sections of the State, are included in this paper for the diseases named. For the entire State it is estimated that these diseases reduced the 1939 crop as follows: Root rot, caused by *Phymatotrichum omnivorum*, 6 per cent.; wilt, caused by *Fusarium vasinfectum*, 1·6 per cent.; *Verticillium* wilt, caused by *Verticillium albo-atrum*, 0·3 per cent.; and leafspot and bollrot, caused by *Bacterium malvacearum*, 2·7 per cent. Depending on the method of calculation, the total reduction in yield of 10·6 per cent. corresponds to a loss of either 337,000 bales or of about 575,000 bales.

180. ON TWO ALTERNARIA SPECIES INJURIOUS TO COTTON FIBRE IN BOLLS. By Y. Nisikado *et al.* (*Ann. Phytopath. Soc. Japan*, x., **2-3**, 1940, p. 214-230. From *Rev. App. Mycol.*, xx., **10**, 1941, p. 461.) Two species of *Alternaria* (*A. macrospora* and *A.* (?) *gossypii*) were recently found attacking cotton fibres in nearly mature bolls in western Japan, the former also affecting the foliage while the latter is mostly confined to the fibres. The inoculation of cotton bolls of varying degrees of maturity resulted in discoloration or blackening of the fibres. The minimum, optimum, and maximum temperatures for the mycelial growth of both species were 5°, 27°-30°, and 36° C. respectively; and the minimum, optimum, and maximum hydrogen-ion concentrations *p*H 2, 5, and 10 respectively.

181. STEM BLIGHT OF COTTON CAUSED BY *Alternaria macrospora*. By L. Ling and J. Y. Yang. (*Phytopathology*, xxx., **7**, 1941, p. 664. From *Rev. App. Mycol.*, xx., **12**, 1941, p. 573.) A stem blight, known locally as "dry scar," of cotton is stated to be widespread and responsible for heavy losses, especially among varieties of Asiatic cotton (*Gossypium arboreum*) in Szechwan Province, China. The pathogen, which is believed to be a strain of *Alternaria macrospora*, produces on the stems, twigs, and leaf petioles of mature plants dark brown, roughly circular spots, gradually turning dark grey and assuming an elliptical or oval shape, the centres at the same time becoming deeply sunken and forming cankers. Diseased tissues usually split longitudinally or crack into fragments,

and finally the infected stem or twig breaks off at the canker, causing the death of part or all of the plant. From the upper part of the petiole the lesion may extend upwards into the midrib and veins near the leaf base. The pathogen was isolated in pure culture on potato dextrose agar, on which it throve at a temperature range of 16°-36° C., with an optimum at 28°. Growth took place over a wide range of hydrogen-ion concentrations, with maxima at pH 4·2 and at 7·6. The fungus is characterized by brown, septate, usually simple conidiophores 21-124 by 4-10μ, and brown, obclavate, conidia 40-288 by 8-29μ, including the beak (from 15 to 216μ long), and provided with 3-13 transverse and 3-5 longitudinal septa. *A. tenuis* was also isolated from diseased leaves only. In inoculation experiments American cotton (*G. hirsutum*) proved equally susceptible with *G. arboreum* to stem blight in the early stages of growth, but gradually acquired some degree of resistance. Wounding increased the incidence of artificial infection on the stems from 70 to 100 per cent. On inoculated bolls the initial minute, greyish-brown spots frequently turn purplish and coalesce, while in a very humid atmosphere conidia develop in sufficient numbers to impart a black cast to the centre of the lesion. In the field the disease is most prevalent in July, just before flowering, serious outbreaks being promoted by successive periods of rainfall and high humidity, in combination with fairly high temperatures. In 1938, for instance, a year with a wet July, 30 per cent. infection was observed in one field, whereas in 1939 the abnormally dry weather arrested the spread of the organism, the damage due to which was almost negligible. *A. macrospora* was experimentally shown to overwinter on dead, infected stalks in the field, while the possibility of seed transmission is indicated by its frequent development from surface-sterilized cotton seeds cultured on agar plates.

182. Factors affecting Mildew Behaviour on Textiles. By B. A. Harold. (*Amer. Dyest. Rpt.*, xxx., 11, 1941, p. 274. From *Rev. App. Mycol.*, xx., 12, 1941, p. 587.) The writer's own observations on the factors affecting mildew development on textiles in the United States are reviewed in connection with the studies along similar lines of Burgess, Galloway, and others.

183. Molds: Development, Identification, Prevention. By J. Rière. (*Amer. Dyest. Rep.*, xxix., 8, 1940, p. 211. From *Rev. App. Mycol.*, xx., 12, 1941, p. 588.) An abstract of a paper published in *Rev. Gén. Mat. Col.*, 55, 1939, in which the following information is presented: Highly polymerized cellulose is attacked only by *Mucor* and *Aspergillus*. The general conditions requisite for the development of mould growth on textiles include humidity, absence of bright light, presence of nutrients, depletion of oxygen, a favourable hydrogen-ion concentration, and a temperature range of 20°-40° C. Black *Aspergillus* (*A. niger* group) grows very slowly at 7°, rapidly at 37°, and not at all above 43°; the white species (? *A. candidus* group) develops most profusely at 25°, and ceases to grow at 37°; while the optimum for the green *Penicillium* is 27°, development being arrested above 39°. Rayon, consisting of depolymerized cellulose, is stated to be particularly subject to fungal infection, being completely transformed into glucose by enzymatic action affecting cotton to the extent of only 30 per cent. Mildew growth liberates heat up to 70°, and this may aid in its detection. Microscopic examination is facilitated by the German practice of boiling in water, treating for a minute or two in a hot aqueous solution of phenol, lactic acid, and glycerine, and then immersing for several minutes in a solution of direct blue dye. After rinsing and reheating in the lactophenol solution to remove excess of dye, the mildewed parts remain coloured and the fibres are ready for examination. Among the most effective antiseptics may be mentioned salicylic acid, beta-naphthol, aristol, the sodium salt of para-chloro-

metacresol, hexylresorcinol, and emulsions of zinc or aluminium naphthenate. In this connection it should be remembered, however, that every antiseptic is not equally effective against all moulds, *Fusarium*, for instance, having been known to develop on a starch mixing containing 10 per cent. zinc chloride, while one or two species of *Aspergillus* utilize salicylic acid. Boiling the fabric may counteract the incipient stages of mould growth, or light chlorination or treatment with 2 per cent. ammonia water may be tried; but even if the visible effects are removed, the weakening of the fibre and modification of its dye affinity will persist.

184. Chemical Treatment of Soil to Control Root-Knot Nematode. By P. A. Young. (*Phytopathology*, **30**, 1940, p. 711. From *Circ.* 93, Texas Agr. Exp. Sta., 1941, p. 26.) Chloropicrin and carbon bisulphide as soil fumigants were effective in controlling the root-knot nematode.

[*Cf.* Abstr. **187**, Vol. XVIII. of this Review.]

185. Cotton Root Rot. By J. E. Simpson. (*53rd Ann. Rpt. Texas Agr. Exp. Sta.*, 1940, p. 15.) Cultures of the cotton root-rot organism tolerated over 100 parts per million of boron, though 200 parts per million reduced the growth. Iron salts stimulated growth up to 100 parts per million of iron, and in larger quantities decreased growth. Selenium at 10 parts per million caused some decrease in growth.

186. Chemistry and Growth of Cotton in Relation to Soil Fertility and Root Rot. By J. E. Adams *et al.* See Abstr. 220 in this issue of the Review.

187. Texas: Root-Rot Infected Cotton: Effect of Insect Control on Yield and Quality. By S. E. Jones. (*Iowa State Coll. J. Sci.*, **16**, 1941, p. 82. From *Summ. Curr. Lit.*, xxii., **3**, 1942, p. 56.) An account is given of a study of the effect of insect control on the yield and quality of cotton from plants killed by root rot before the first normal picking. Plots were selected in fields in Texas where root rot was known to occur and there was already present, an incipient flea-hopper infestation. Sulphur dust was used for the control of the flea hopper and calcium arsenate dust for boll-weevil control. Plants which died during each week were marked with a dated tag. The cotton was picked from the dead plants at the time of the first normal picking, and from the plants which were living at that time. The total yield from each group of plants was accurately weighed and quality determinations were made of seed and lint. All bolls which opened, regardless of size, were picked. Low yields from plants prematurely killed by root rot were not materially increased by insect control measures. Such plants produced only a small amount of low quality cotton even when there was no insect damage. It is pointed out that the factor which determines the profit to be made from controlling insects on land where cotton dies from root rot is the yield from living plants regardless of the percentage dying early in the season. If the yield from living plants is sufficient for profitable cotton production and insects are damaging the crop, control measures should be used.

188. Are Ammonium Salts Toxic to the Cotton Root-Rot Fungus? By L. M. Blank and P. J. Talley. (*Phytopathology*, xxxi., **10**, 1941, p. 926. From *Rev. App. Mycol.*, xxi., **2**, 1942, p. 75.) No evidence was obtained in the writers' further studies at the Texas Agricultural Experiment Station on the action of several concentrations ranging from 0·0063 to 0·075 M of ammonium sulphate and ammonium phosphate on cultures of the cotton root-rot fungus, *Phymatotrichum omnivorum*, in a synthetic nutrient solution, that the toxicity of these compounds to the pathogen is a property of the ammonium ion. An acid

condition, inhibiting further growth, rapidly develops in improperly constituted nutrient solutions with ammonium salts as the nitrogen source; this may be prevented by the addition of calcium carbonate in the proper amount to result in a 0·0125 M concentration in the final volume. Ammonium nitrogen was found to provide a good source of nitrogen for *P. omnivorum* in soil cultures, no evidence of toxicity being observed with concentrations up to 0·075 M. These data suggest that the beneficial effects of the treatment of diseased plants with ammonium compounds represent a response to the reception of additional supplies of available nitrogen rather than a reduction in the virulence of the pathogen, and it is doubtful, therefore, whether permanent eradication and control can be achieved by the use of ammonium salts.

189. A Photoelectric Method and its Use for Determination of Fungus Growth Rates. By L. A. Adair and E. J. Moore. (*Phytopathology*, xxxi., **5**, 1941, p. 448. From *Rev. App. Mycol.*, xxi., **10**, 1941, p. 462.) Details are given of an accurate and rapid photoelectric method for the determination of the amount of growth produced by the cotton root-rot fungus (*Phymatotrichum omnivorum*). The results secured by means of the technique agree closely with the data yielded by gravimetric methods for larger colonies, while for smaller ones the photoelectric instrument is more reliable.

190. Soil Bacteriological Studies on the Control of the *Phymatotrichum* Root Rot of Cotton. By R. B. Mitchell *et al.* (*J. Agr. Res.*, **63**, 9, 1941, p. 535.) Hunt clay to which no organic material was added permitted growth and persistence of *Phymatotrichum omnivorum* mycelium over the soil and root surfaces in open containers inoculated with segments of recently infected cotton roots, when maintained under favourable moisture and temperature conditions. Soil containing added organic matter, but otherwise similarly inoculated and maintained, either completely inhibited the growth of *P. omnivorum* or permitted initial growth which was followed by disintegration of mycelium. Under field conditions, cotton roots injured during the late summer or early fall showed pronounced increases in micropopulations associated with root surfaces; such increases were proportionately greater than those caused in soil by organic amendments and found inimical to the growth of the parasite.

The majority of *Phymatotrichum omnivorum* sclerotia buried in organic-amended soil were quickly destroyed; in contrast, the great majority of sclerotia buried in soil without organic residues persisted. Sclerotia remaining after subsidence of the microbial activity occasioned by fertilization persisted with little further reduction in numbers for several months; for the elimination of either mycelium or sclerotia, treatments with organic materials were especially effective during the period of increased microbial activity. Removal of the competitive effects of other microbes by soil sterilization, and subsequent reinoculation with *P. omnivorum*, permitted good growth of fungus mycelium, regardless of the amount of decomposition which the cotton roots or organic residues employed had previously undergone. Fungus survival was considered, therefore, to be limited by microbial inter-relationships rather than by food exhaustion. It was observed that during the early stages of incubation viable sclerotia disappeared more rapidly from amended soils than killed sclerotia; the importance of sclerotia germination as one factor in soil sanitation was thus suggested. That other factors were operative also was suggested by the greater elimination of heat-killed sclerotia from organic-amended soil than from unamended check soil. Following field application of organic materials, together with early October ploughing, increased microbial activity, reduction of the incidence of dead cotton in the succeeding crop, and greater difficulty of sclerotia recovery from the amended levels in field soil were observed.

191. THE CARBON UTILIZATION AND CARBOHYDRATE ACTIVITY OF *Phymatotrichum omnivorum*. By L. M. Blank and P. J. Talley. (*Amer. J. Bot.*, xxviii., 7, 1941, p. 564. From *Rev. App. Mycol.*, xx., **12**, 1941, p. 574.) The growth of *Phymatotrichum omnivorum* on different types of carbohydrates was determined by quantitative measurements. The results varied according to whether sterilization was effected by autoclaving or by treatment with alcohol, but no adequate explanation was found for these differences. Glucose, fructose, and mannose proved to be the best carbon sources. The utilization of polysaccharides was found to be correlated with the ability of the fungus to hydrolyze them and the rates to which they were hydrolyzed.

192. STUDIES ON THE ROOT-ROT DISEASE OF COTTON IN THE PUNJAB. IX. VARIETAL SUSCEPTIBILITY TO THE DISEASE. By J. C. Luthra and R. S. Vasudeva. (*Ind. J. Agr. Soc.*, xi., **3**, 1941, p. 410.) A very large number of varieties of cottons, both indigenous and exotic, have been tested with a view to finding a type resistant to root-rot disease in the Punjab. None of those tested has shown any appreciable resistance to the disease. Selfed seeds of apparently healthy plants in diseased plots did not yield resistant plants.

X. EFFECT OF CERTAIN FUNGI ON THE GROWTH OF ROOT-ROT FUNGI. By R. S. Vasudeva and M. R. Sikka (p. 422.) The presence of *Trichoderma lignorum* and *Aspergillus niger* in the inoculum of *Rhizoctonia bataticola* and *R. solani* greatly interferes with the growth of the latter fungi. The hyphæ of *Trichoderma lignorum* and *Aspergillus niger* show a dissolving effect on the hyphæ of *R. bataticola* and *R. solani*. The activity of filtrates of the latter is reduced when these fungi are grown mixed with *Trichoderma lignorum* and *Aspergillus niger*.

[*Cf.* Abstrs. **307**, Vol. XIII.; **127**, **711**, Vol. XIV.; **139**, Vol. XV.; **509**, **709**, Vol. XVI.; **235**, Vol. XVII.; and **178**, Vol. XVIII. of this Review.]

193. RELATION OF AGE OF COTTON PLANTS TO SUSCEPTIBILITY TO FIELD INOCULATION WITH *Phymatotrichum* ROOT ROT. By W. N. Ezekiel. (*Phytopathology*, **30**, 1940, 704. From *Circ.* 93, Texas Agr. Exp. Sta., 1941.) Summarizes an experiment in which cotton was planted at intervals during the season, and the plants all inoculated on July 28, 1939. Three months later the final notes showed:

Age of plants when inoculated, weeks:	14	10	6	3	0
Plants succumbing to root-rot, per cent.:	71·1	60·4	42·4	16·6	2·9

It is concluded that absence of symptomatic root rot on younger plants under field conditions is evidence of inherent differences between older and younger plants, rather than simply a matter of accidental escape.

194. ALKALOIDS FROM *Zephyranthes texana, Cooperia pedunculata* AND OTHER AMARYLLIDACEÆ AND THEIR TOXICITY TO *Phymatotrichum omnivorum*. By G. A. Greathouse and N. E. Rigler. (*Amer. J. Bot.*, xxviii., **8**, 1941, p. 702. From *Rev. App. Mycol.*, xxi., **2**, 1942, p. 75.) The alkaloid lycorine, present in the bulb and root tissues of *Zephyranthes texana* and *Cooperia pedunculata* in concentrations of 0·02 and 0·04-0·05 per cent. respectively of the fresh weight, was shown in tests at the Texas Agricultural Experiment Station to prevent the growth of *Phymatotrichum omnivorum,* the agent of root rot of cotton and other crops, at a strength of 0·003 per cent., while a second alkaloid, presumed to be ψ-lycorine, isolated from the mother liquors of *C. pedunculata* at a concentration of approximately 0·002 per cent., acted similarly on the fungus at a strength of 0·0045 per cent. The total quantities of lycorine and ψ-lycorine present in *Z. texana* and *C. pedunculata* respectively were about 7 and 15 times as much respectively as was necessary to inhibit the development of *P.*

omnivorum. Various organs, notably the peripheral bulb scales, the shortened stem, and the roots of 11 other species of Amaryllidaceæ, were also found to contribute to the established immunity from root rot of members of this family.

195. EFFECT OF GIRDLING AND TOPPING OF COTTON PLANTS ON SURVIVAL OF *Phymatrotrichum omnivorum* ON THE ROOTS. By W. N. Ezekiel. (*Phytopathology*, **30**, 1940, 704. From *Circ.* 93, Texas Agr. Exp. Sta., 1941, p. 24.) Summarizes further tests of girdling and topping of cotton plants at the advancing edges of root-rot spots. In this experiment *P. omnivorum* was recovered from 31·4 per cent. of check plants, from 21·8 per cent. of girdled plants, and from 9·5 per cent. of topped plants. The roots were apparently changed by both treatments sufficiently to reduce not only the percentage of plants on which *Phymatotrichum* survived, but also the extent and profusion of growth of the fungus from those roots on which it was still alive.

[*Cf.* Abstr. **238**, Vol. XVII. of this Review.]

196. EFFECTS OF ORGANIC AMENDMENTS UPON THE MICROFLORA OF THE RHIZOSPHERE OF COTTON AND WHEAT. By F. E. Clark and C. Thom. (*Soil Sci. Soc., Amer. Proc.*, **4**, 1939, p. 230. From *Exp. Sta. Rec.*, **85**, 2, 1941, p. 208.) Addition of various sources of organic matter to the soil produced striking changes in the microbiological populations of the soil mass in general, but had little effect upon the organisms associated with crop roots themselves. The experiments were carried out with wheat in soil infected with *Ophiobolus graminis* and in sterilized soil, and with cotton in soil infected with *Phymatotrichum omnivorum*. With respect to the effects upon root infections, it is concluded that " even though experimental controls of root-rotting parasites may be obtained by the inoculation of infested soil with saprophytic micro-organisms or filtrates thereof, it is questionable whether root surfaces can be protected on any practical scale in the field by inoculation procedures with common soil saprophytes."

197. A STUDY ON THE INFECTION OF COTTON SEEDLINGS BY *Rhizoctonia solani*. By T. Nakayama. (*Ann. Phytopath. Soc. Japan*, x., **2-3**, 1940, pp. 93-103. From *Rev. App. Mycol.*, xx., **10**, 1941, p. 461.) The invading hyphæ of *Rhizoctonia* (*Corticium*) *solani*, inoculated into cotton seedlings in Petri dishes, proceeded along the slight depression in the epidermis above the junction of the epidermal cells of the root, hypocotyl, and cotyledon, the depression becoming intensified as the hyphæ adhered more closely. The root tips proved very susceptible to infection, the fungus penetrating the epidermis and branching out inter- and intracellularly into the endodermal region. Permeation of the root was likewise effected through the natural injuries associated with the extrusion of new secondary rootlets from the tap root. " Infection cushions " were the principal means of ingress into the hypocotyl, infection by simple hyphæ occurring rarely. The cuticle and stomatal apertures served as sites of entry into the cotyledons, the lower surface being penetrated chiefly through the latter channel, while both types of infection were present on the upper side.

198. COTTONSEED DUSTING IN RELATION TO CONTROL OF SEEDLING INFECTION BY *Rhizoctonia* IN THE SOIL. By S. G. Lehman. (*Phytopathology*, **30**, 10, 1940, p. 847. From *Exp. Sta. Rec.*, **84**, 3, 1941, p. 348.) Non-dusted cottonseed and that dusted with 5 per cent. ethyl mercury phosphate preparation were planted in steamed soil previously inoculated with *R. solani*. Controls were run in non-inoculated soil. Counts of total emergence, living seedlings, and disease-free seedlings were made, and the results of statistical analysis are given. Dusted seed showed significantly greater improvement in seedling emergence on infested than on non-infested soil in plantings made soon after inoculating the soil,

but not in plantings made several weeks afterward. The percentage of seedlings living after emergence, also the percentage escaping stem infections, were increased by seed treatment in all tests, but the increase was not relatively greater by a statistically significant amount on inoculated than on non-inoculated soil. The results are taken to indicate that, so far as final seedling stands are concerned, such dusts applied to cottonseed before planting may be of little, if any, value. However, their protective action against fungi on the seed is unquestioned.

199. The Genus Fusarium. VI. A Recent Attempt at Mass Revision. By G. W. Padwick. (*Ind. J. Agr. Sci.*, xi., **5**, 1941, p. 663.) The history of the division of species of *Fusarium* into sections is outlined in relation to sections Elegans, Lateritium and Liseola. It is shown that the present conception of the sections Elegans, Lateritium and Liseola does not agree with the original descriptions. Elegans was split up into two sections, one retaining the original name and that of Liseola being given to the other. It is as difficult to place borderline members of the three sections in the correct section as it is to identify correctly the species within a section. Snyder and Hansen (1940) assume that, whereas the so-called species within the section Elegans (and similarly in other sections) must be regarded as one species, the major grouping into sections in Wollenweber's system and the original description of the section Elegans are acceptable. It is shown that this assumption is contrary to the facts as clearly indicated, firstly by careful consideration of the way in which the sections Elegans, Lateritium and Liseola were built up and described, and secondly by the existence of intermediate forms. It is concluded that, although the work of Snyder and Hansen (1940) and Hansen and Smith (1932, 1938) must eventually influence classification within the genus, proper revision can only result from the combined efforts of workers in a position to study the various *Fusaria* in their natural habitat. The ultimate classification will have to give sufficient weight to ecological factors and geographical distribution. Nomenclatural changes proposed up to the present are summarized.

[*Cf.* Abstrs. **445, 446**, Vol. XVIII. of this Review.]

200. Wilt-Infected Cotton Plants; Response to Nutrients. By G. M. Armstrong and W. B. Albert. (*Proc. Asscn. Southern Agr. Wkrs.*, **42**, 1941, p. 198. From *J. Text. Inst.*, xxxiii., **2**, 1942, A63.) Wilt-infected cotton developed worse and died sooner in culture solutions containing a low potash supply. Healthy plants absorbed more KNO_3, ammonia N, and Ca than wilt-infected plants; there was some evidence that dying plants gave up K to the solution. The rate of growth of plants was not affected by variations in Mg content of the solutions, but symptoms of Mg deficiency were observed in the foliage when the Mg. supply was low.

201. Wilted Cotton Plant: Intake of Tannin. By B. P. Strogonov. (*C. r. Acad. Sci.*, U.S.S.R., **29**, 1940, p. 628. From *Summ. Curr. Lit.*, xxi., **22**, 1941, p. 555.) Sound and diseased cotton stems utilize tannin as a nutrient in both wood and bark, and develop tannin from infiltered glucose.

202. A Solution-Culture Infection Method used in the Study of *Fusarium* Wilt. By G. M. Armstrong. (*Phytopathology*, xxxi., **6**, 1941, p. 549. From *Rev. App. Mycol.*, xx., **11**, 1941, p. 531.) The following methods provided uniformly high percentages of infection on cotton seedlings in inoculation experiments with *Fusarium vasinfectum* at the South Carolina Agricultural Experiment Station. In the first series of tests the seed was germinated in sterilized sand in trays, and the most vigorous seedlings dipped into nutrient solution cultures of the pathogens for periods ranging from 10 to 90 minutes,

after which they were transferred to regular nutrient solutions. The high percentage (37·5) of re-isolations, even of weak isolates of the fungus from a resistant variety (Sea Island), indicates that this technique affords conditions approximating to those of severe field infection. The tank or tray method represents an attempt at the further simplification of seedling production for inoculations. Soaked seed is grown in boiled and soaked "excelsior" (wood-wool packing material) placed over the wire netting of $\frac{1}{4}$-inch mesh attached to the lower edge of a wooden frame fitted tightly into a metal tray $21 \times 13 \times 8$ inches to the depth of 1 inch, and the roots allowed to grow into the water or nutrient solution below. Inoculations were made by dipping the roots in a nutrient solution culture of the pathogen in another tray 3 inches deep, which resulted in 80 to 100 per cent. infection. This method permits the use of a large number of plants per unit area.

203. Cotton Wilt and Root-Knot Investigation in Georgia. (*Ga. Ann. Rpt.*, 1940-41, p. 25.) In general a close positive relationship occurred between wilt resistance and root-knot resistance. Such varieties as Early Wilt 4 in 1-3, 4 in 1-4, Cleveland W.R.6, Rhyne Cook, and Early Cleveland W.R. combine resistance to both pathogens.

204. Cotton Plant: Wilt Resistance and Phosphorus Supply. (1) By A. L. Smith, (2) by D. C. Neal. (*Proc. Asscn. Southern Agr. Wkrs.*, **42**, 1941, p. 199. From *Summ. Curr. Lit.*, xxii., **2**, 1942, p. 25.) (1) In North and South Carolina and Georgia the average incidence of cotton wilt appears to be slightly greater if the P content of the fertilizer is increased from 6 to 12 per cent. in mixtures containing N 6 per cent. and K_2O 6 per cent. applied at the rate of 600 lb. per acre. In the Central Southern States there was no evidence of this effect. (2) The above effect of doubling the P content of the fertilizer was not observed in Louisiana.

GENERAL BOTANY, BREEDING, ETC.

205. Textbook of Botany. By E. N. Transeau, H. C. Sampson and L. H. Tiffany. (Harper and Bros., London, 1940. Price $4.00. From *Pl. Bre. Absts.*, xi., **4**, 1941, p. 335.) This new textbook of botany has several attractive features. It is printed in a clear and pleasant type, well bound, and provided with ample and very good illustrations. In the more important matter of the text we find a refreshing concentration on the dynamic aspects of the subject and on experiment and observation. The book is, in fact, designed to supplement practical work. This, combined with the attention paid to the relation of plants to man and the insistence on scientific methods of thought, justifies the publishers' adjective "modern." All aspects of botany are covered in the 53 chapters, and there are references for further reading. In future editions the authors would do well to revise the chapters on heredity. For example, the only instance of linkage given is one of complete linkage, and the intelligent reader, applying the principles stressed throughout the book, could pertinently ask how it is to be known that two genes are concerned, and not one, without getting any satisfactory answer. Later, on p. 481, we find crossing-over confused with translocation and segmental interchange as an "irregularity." In view of this error it is not surprising to find the obsolete distinction of the first division of meiosis as the "reduction division" perpetuated (not to say perpetrated) on p. 450. The elimination of blemishes of this type, which one would resignedly accept as inevitable in the average botany textbook, will make this book an outstanding contribution to botanical literature.

206. Plant Science Formulæ: A Reference Book for Plant Science Laboratories (Including Bacteriology). By R. C. McLean and W. R.

Ivimey Cook. (Macmillan and Co., Ltd., London, 1941. Price 7s. 6d. From *Pl. Bre. Absts.*, xi., 4, 1941, p. 334.) This book should prove invaluable to every botanical worker; it contains, ready to hand, formulæ for practically every process normally used in the laboratory. It would certainly have saved the reviewer many hours of search in half-remembered sources for some elusive formula. The range of material is very wide. Perhaps most important to the cytogeneticist and breeder are the sections on fixatives, stains and other aspects of microscopic technique, the preparation of museum specimens, chemical and microchemical reagents, solutions for volumetric analysis and photographic reagents. In addition there are formulæ for the preparation of culture and nutrient solutions and solid media, a varied list of formulæ for use in the workshop, a list of suppliers, and many other useful pieces of information. The subject matter of the book is, on the whole, admirably chosen. While the reviewer has not checked large numbers of the formulæ, perusal of familiar ones gave the impression that the proof reading had been very carefully done. Two mistakes were noted in the section on viscosities (p. 163). In the section on photographic reagents it would probably have been more useful to give formulæ for modern fine-grain developers of the paraphenylinediamine type than to include the now rarely used pyro-soda and a formula for physical development, but for the first edition of a book of this type remarkably few such criticisms can be made.

207. Hunger Signs in Crops. A Symposium. Edited by Gove Hambidge. (The Amer. Soc. Agr. and The Nat. Fert. Asscn., Washington, D.C., 1941. Price \$2.50. From *Bull. Imp. Inst.*, xxxix., 3, 1941, p. 277.) When agricultural research and experiment along any line have progressed to a practically useful stage the work must be carried one step further in passing on to the grower the knowledge gained. It is this step between the experiment station and the farmer that this book is designed to fill, by giving a concise account of the deficiency symptoms of the more important food crops, and thus to enable the farmer to recognize, in many cases, the causes of nutritional disorders in his crops and to take measures to correct them. The subject matter is presented in eight chapters, contributed mainly by members of staffs of experiment stations taking part in the original investigation work, and the crops considered are tobacco, maize, cotton, potato, vegetables and market garden crops, deciduous fruits, legumes and citrus. The symptoms are discussed under the headings of the different elements concerned, and in some cases keys are given to assist in the diagnosis, and chemical tissue tests are described as a means of confirming suspected deficiencies. The text is well illustrated with numerous excellent photographs, mostly coloured, which must prove an extremely valuable aid to recognizing the conditions described. No claim is made for the book as a final word on the subject; it simply represents a summary of the data so far available put into a form that the non-technical man can understand, and as such it is an excellent piece of work.

208. Processes of Organic Evolution. By R. Ruggles Gates. (*Sci.*, 93, 1941, p. 335. From *Pl. Bre. Absts.*, xi., 4, 1941, p. 272.) The author is of the opinion that both large and small mutations are important in evolution.

209. Studies on Nucleoli in Plant Cells. Parts 1-3. By S. Suematsu. (*Bot. and Zool.*, 5, 1937, pp. 1876, 2042, 2217. From *Pl. Bre. Absts.*, xi., 4, 1941, p. 272.) A survey of the contributions of research workers in different countries throughout the world to the various problems pertaining to the structure of the nucleolus, and the correct interpretation of its behaviour and its functions in the life of the cell.

210. Application of Infra-Red Photomicrography to Cytology. By G. Yamaha. (*Bot. and Zool.*, 5, 1937, p. 2263. From *Pl. Bre. Absts.*, xi., 4, 1941,

p. 272). A brief note on the use of infra-red photography in cytology, with some advice on the technique.

211. Organization of the Cell and the Chromosome Theory of Heredity. By M. L. Belgovsky *et al.* (*Bull. Acad. Sci., U.S.S.R.*, Ser. Biol., No. 5, 1940, p. 662. From *Pl. Bre. Absts.*, xi., **4**, 1941, p. 270.) The authors give a careful and accurate exposition of genetical theory, of the experimental evidence on which it is based, and of the modifications made in the theory in accordance with recent developments and discoveries; a number of points on which misconceptions have arisen in the U.S.S.R. are cleared up. The editor adds a footnote to the effect that he " is not in agreement with many of the authors' views, and considers that a solution of the questions concerned will only be possible by a synthesis of the positive achievements of cytogenetics and developmental biology, the zygote and developing organism being regarded as a whole and in the closest relationship with the environment."

212. Neue Ergebnisse und Probleme auf dem Gebiet des Chromosomenbaues. By L. Geitler. (*Naturwissenschaften*, **28**, 1940, p. 649. From *Pl. Bre. Absts.*, xi., **4**, 1941, p. 272.) A concise and well-documented survey and critical analysis of recent cytological research on the gross and microscopic structure of chromosomes; specialization and its underlying structural basis and the chromonema; the chromomere and heterochromatin; and their nature and functions in relation to the gene concept. The author leans towards the view that changes in spiralization are responsible for many of the observed phenomena, and that the linear order of the genes is capable of interpretation on the assumption that they consist of side-chains along a continuous polypeptide chain serving as basis.

213. Homologous Chromosome Pairing: The Physical Problem. By A. C. Fabergé. (*Jour. Gen.*, **43**, 1-2, January, 1942, p. 121.) Homologous pairing of chromosomes is discussed in its physical aspects. The relevant facts about the cytology of pairing are examined, and the conditions stated which must be satisfied by any physical explanation. It is pointed out that these requirements are at first sight contradictory. A physical hypothesis to explain homologous pairing is put forward, making use of the Guyot-Bjerknes effect, a hydrodynamical phenomenon which results from the operation of Bernoulli's theorem. The justification for putting forward such a speculative hypothesis is that it appears capable of satisfying all the conditions imposed by known biological facts, facts which seem otherwise extremely difficult to explain. The physical consequences of the view proposed are examined in detail, and no impossibilities are found, provided it is assumed that the unit of homology is somewhat larger than the usual estimates of gene size, corresponding more nearly to a group of genes of the diameter of the visible leptotene chromosome.

214. The Indian Journal of Genetics and Plant Breeding. We have received a copy of the first issue (Vol. I., December, 1941) of this new journal, which is the official organ of the Indian Society of Genetics and Plant Breeding founded in January, 1941. The journal will publish original articles by members of the Society on research in the field of genetics and plant breeding, cytology, physiology, and cognate sciences. The first issue contains the following among other papers: " Some Ideas and Opportunities for Plant Geneticists in India " (W. Burns); " Colchicine-induced Polyploidy in Crop Plants. II. Chilli (*Capsicum annuum*, L.)" (B. P. Paul *et al.*); " Studies in the Vernalization of Indian Crop Plants. I. Preliminary Experiments on Gram, Wheat, Chilli, and Soybean " (B. P. Pal and G. S. Murty). The cost of the present issue (the only one in 1941) is Rs. 8 in India and Rs. 8-8 abroad. Future publication will be twice a year,

the annual subscription (for non-members) being Rs. 15 in India, and Rs. 16 for other countries, inclusive of postage. We wish the new journal every success.

215. A Short Review of Genetical and Plant Breeding Work in Cotton, with Suggestions for the Future. By K. Ramiah. (Ind. Cent. Cott. Comm. 2nd Conf. Sci. Res. Wkrs. Cotton, India, Genet. and Pl. Bre. Paper No. 1. From *Pl. Bre. Absts.*, xii., 1, 1942, p. 10.) The topics discussed in this short review are selection, quantitative inheritance, breeding for quality, choice of parents for crossing, discriminant function, correlation and linkage, breeding for wilt resistance, species relationship, collection of breeding material, and maintenance of purity of strains. Suggestions are made for future genetical and breeding work with cotton in India. The author emphasizes the inter-relationship of genetical and plant-breeding work.

216. Plant Breeding and Genetical Work in India. By K. Ramiah. (*Proc. 28th Ind. Sci. Cong.*, Benares, 1941, Pt. II.) A report of the presidential address delivered by Mr. Ramiah to the Agricultural Section of the Congress, in which he gives a brief outline of the plant breeding and genetical work in India, mainly in connection with cotton and rice, and indicates in what manner the advances in genetical science can influence plant breeding practices. The subject is discussed under the following headings: *A Survey of Plant Breeding Results:* spread of improved types; need for improved agricultural statistics. *Methods of Breeding:* selection in natural and in hybrid populations; mixture of pure strains. *Development of Genetical Science:* genetical work in India. *Genetics in Relation to Plant Breeding:* quantitative inheritance; heterosis; physiological and genetic correlations; use of "discriminant function"; wide crosses; limitations in wide crosses. *Maintenance of Purity of Strains. Organization of Genetical Research. Genetical Work and the Universities.*

217. Average Excess and Average Effect of a Gene Substitution. By R. A. Fisher. (*Ann. Eugen.*, 11, 1941, p. 53. From *Pl. Bre. Absts.*, xii., 1, 1942, p. 5.) The author clarifies and develops the theory of gene substitution. He stresses the difference between the fundamental quantities of the average effect and average excess. It may be assumed that these are equal only for groups for which random mating has for long been the rule. In the light of this distinction the author enters on a critical discussion of a law of "increase in biological fitness" put forward by Sewall Wright (1937). The author's principal objection to Wright's formula is that it yields selection intensity from an *average* behaviour of the species as a whole (change in average survival value) without regard to competition among individuals. He amplifies this point by discussing a hypothetical example which is examined in detail. A hypothetical factor is assumed to affect self-fertilization, and selective activity is shown to be present although there is no change in the average survival value of the population. The theory of this example involves an interesting mathematical problem. The frequencies of three types of fertilization are linked from generation to generation by three non-linear recurrence equations of a type frequently met with in genetic problems. An approximate general solution of these equations is given with the help of power series, and the accuracy of the solution is checked in a special case where the recurrence formulæ were worked out by the tedious numerical process.

218. Selektion und Stammesentwicklung (Selection and Phylogeny). By W. Ludwig. (*Naturwissenschaften*, 28, 1940, p. 689. From *Pl. Bre. Absts.*, xi., 4, 1941, p. 272.) This is a critical essay on the problem of the mechanism or mechanisms of evolution and phylogenetic development in the plant and animal kingdoms. Evidence bearing on the relative significance of selection and

mutation as factors in the evolutionary process is discussed, and the need for limiting the importance of chance as a causal agency in selection is stressed. An extensive bibliography of recent literature is appended.

219. THE CALCULATION AND PRECISION OF LINKAGE VALUES FROM TETRAD ANALYSIS. By K. Mather and G. H. Beale. (*Jour. Gen.*, **43**, 1-2, January, 1942, p. 1.) The usual type of genetic experiment utilizes only one of the four spores resulting from meiosis in a mother cell. In some organisms it is possible to make a genetical analysis of all four spores, and such analyses will yield considerably more information about linkage of two genes, or of gene and centromere, than does the common type of genetical experiment. The observations made on different spores of the same tetrad are, however, not independent, but the problems of estimation which arise may be overcome by the method of maximum likelihood. Estimation of the recombination fraction and its variance from completely and incompletely analyzed tetrads with and without viability disturbances is considered. The relative values of the various types of data are given, and the appropriate method of combining them in a single estimation is also given. Special attention is paid to the cases of close linkage of two genes, and linkage of a gene to the centromere. The calculation of coincidence values and their variances is discussed. Many of the calculations are illustrated arithmetically, using data from segregation in *Neurospora crassa.*

220. CHEMISTRY AND GROWTH OF COTTON IN RELATION TO SOIL FERTILITY AND ROOT ROT. By J. E. Adams *et al.* (*Soil Sci. Soc. Amer. Proc.*, **4**, 1939, p. 329. From *Exp. Sta. Rec.*, **84**, 3, 1941, p. 348.) Data analyzed by variance methods are quoted to show that highly significant reductions in mortality from *Phymatotrichum* root rot were associated with 15-0-0, 9-3-0, and 9-3-3 fertilizers, and highly significant increases with the 0-15-0 ratio of ingredients. In the tests reported, the N contents of root-bark samples on August 15 and September 20, and of leaf samples on July 20 and August 15, were affected sufficiently to give highly significant negative values for the correlation coefficient r between N contents and mortality data. The value of r between the P_2O_5 contents of root bark on September 20 and mortality at a comparable date was positive and highly significant. A highly inverse correlation was found between P_2O_5 and N contents of root-bark samples taken on September 20. These data indicate that the chemical composition of root bark and leaves of cotton, as affected by fertilizer treatment, is correlated with the mortality of cotton on the plats from which the samples were taken. Differences in the incidence of the disease as affected by fertilizer treatment were not as numerous or as outstanding for the soils of the Houston as for those of the Wilson series. The turning under of the stalks as soon as the cotton was picked, with bedding later in the season, as compared with the prevailing practice of bedding in December or January, resulted in outstanding reductions in mortality. This appears to be due to an effect on the fungus parasite, abetted by chemical composition.

221. A HERITABLE FEMALE-STERILE TYPE IN COTTON. By G. N. Stroman. (*J. Hered.*, **32**, 1941, p. 167. From *Pl. Bre. Absts.*, xii., **1**, 1942, p. 59.) A common form of "rogue" in Acala No. 8 cotton is a type that has no bolls and is very tall. Segregations in the progenies of normal plants approximate to 3 normals : 1 sterile.

222. SOME FACTORS THAT INFLUENCE THE IMMEDIATE EFFECTS OF POLLEN ON BOLL CHARACTERS IN COTTON. By H. J. Fulton. (*J. Agr. Res.*, **63**, 8, 1941, p. 469.) Strains of cotton inbred from 11 to 20 years or more were used to test the immediate effects of pollen on boll characters. Emasculated flowers of Acala cotton were pollinated with (1) Pima pollen, (2) Acala pollen, and (3) Hopi pollen, the Acala pollen having been taken from plants of the same inbred strain

that comprised the pistillate plants receiving all three cross-pollinations. Significant differences among means for the several cross-pollinations were obtained in number of seeds per boll, in seed index, in lint index, in fibre length, and in boll-maturation period. It is shown that effects upon the expression of these characters by differences between (1) different years, (2) different days of anthesis in the same year, and (3) different individual plants used as pistillate parents are so great as conceivably to mask completely the effects, if any, of different pollens. The difference between means for different years approximated the average difference between means for the several cross-pollinations in all characters except number of seeds per boll. In this character the difference, although highly significant, was smaller than the minimum difference between means of cross-pollinations. In both seasons the maximum difference among means for successive days of anthesis and among means for each of the individual pistillate plants exceeded the maximum difference among means of the several cross-pollinations. An assumed nutritional factor was shown to affect the expression of seed index, of fibre length, and probably of lint index. This suggests that a difference among the several pollens in ability to fertilize a high percentage of the ovules was another factor that determines the effects of cross-pollinations. The influence of these various factors, and undoubtedly of others not covered by this study, are so intermingled that it is impossible to rank them in the order of their importance.

223. Influences of Enforced Self-Pollination in Cotton on Fruiting and Yield. By I. R. Krasovskii. (*Jarovizacija*, **1**, 34, 1941, p. 104. From *Pl. Bre. Absts.*, xii., **1**, 1942, p. 59.) Seed from plants of a number of varieties of *Gossypium hirsutum* that had been artificially self-pollinated for a number of years was compared with seed from the same varieties open-pollinated. The plants of the control were taller, flowered 2-3 days earlier and ripened sooner; they had a greater number of bolls per plant and of seeds per boll, especially in comparison with the varieties that had been selfed for longer periods.

224. Cottonseed Epidermal Cells: Structure. By W. Wergin. (*Planta*, **30**, 1940, p. 800. From *J. Text. Inst.*, xxxii., **21**, 1941, A583.) The outer walls of the epidermal cells of cottonseed (*G. barbadense*) show a foliar structure. Before these walls grow out into hairs, areas of thickening with pronounced double refraction appear on them; they apparently represent reserves of wax-like wall material.

225. Seed Cover and Plant Colour and their Inter-relations with Lint and Seed in Upland Cotton. By J. O. Ware. (*J. Amer. Soc. Agron.*, **33**, 1941, p. 420. From *Pl. Bre. Absts.*, xi., **4**, 1941, p. 305.) F_2 segregations were studied in two crosses between two plants from different lines of a red variety of Upland cotton (Winesap) and two plants from the same line of the No Lint variety. The two Winesap parent plants differed in degree of seed cover—one had seeds completely covered with fuzz, while the other plant had a seed cover approximating to Thadani's felted. Plant colour and seed cover (degree of fuzziness) were found to be inherited independently. Naked seeds and sparse lint are controlled either by two completely linked genes or by the same gene. The F_2 segregated into three general seed cover classes—fuzzy, naked-adherent, and naked. The highest lint levels were found in the fuzzy plants of the F_2 generation and very low lint levels in naked plants. The changes in lint level with different degrees of seed cover were also investigated. Plant colour was found to be independent of lint level, and seed index also did not appear to be associated with seed cover. High seed index might possibly be associated with green plant colour.

226. Cotton Leaf: Area Measurement. By N. C. Thirumalachary. (*Ind. J. Agr. Sci.*, **10**, 1941, p. 835. From *Summ..Curr. Lit.*, xxi., **24**, 1941, p. 630.) A study was made of methods of determining leaf areas based on measurements of the area of the rectangle enclosing the entire leaf, the area of the rectangle the sides of which are formed by the length of the midrib and the maximum breadth between the basal lobes, and the area of the rectangle whose sides can be represented by the length of the midrib and the breadth between the tips of the second and fourth lobes respectively, and a method which involves matching each leaf against artificially prepared standards of known area cut out of ordinary cardboard. For the last method, about 100 leaves of ages ranging from 10 to 60 days were collected from a field of Cambodia cotton plants and their individual outlines sketched carefully on a piece of cardboard. The area of each of the 100 sketches was then measured twice by means of a planimeter, and the average of the two readings was noted on each sketch. Thirty of these sketches were chosen so as to constitute an ascending scale of areas. The leaf under test was then matched against its probable compeer among the standards. With a little experience the excess of deficit over the standard was easily estimated by mere eye judgment. Results obtained by the four methods are given, together with actual planimeter measurements, and the results of statistical analyses of the data are discussed. It is shown that the cardboard method is superior to the other methods in precision and in the ease and rapidity with which it can be carried out. It has a special advantage in that the leaves can be measured without being removed from the plant or injured in any way.

227. Inheritance of Smooth and Pitted Bolls in Pima Cotton. By E. Gordon Smith. (*J. Agr. Res.*, **64**, 2, 1942, p. 101.) Although the presence or absence of pits on the bolls is of taxonomic importance in the genus *Gossypium*, the inheritance had not been analyzed successfully previous to the present study, according to Kearney and Harland. The latter suggests that Mendelian segregation may be obscured in interspecific cotton crosses by the "large number of different genetical backgrounds upon which the given pair of alleles would manifest themselves." This hypothesis offers an explanation for the difficulty encountered by investigators who have worked with interspecific hybrid populations. The present success with the pitted-boll character may be accounted for on the assumption of similar genetic backgrounds in P Hope and ordinary Pima. Even though P Hope may have originated by natural hybridization between Pima (*G. barbadense*) and Upland cotton (*G. hirsutum*), a Pima-like genetic background could have been acquired by repeated natural back-crossing on Pima prior to the discovery of the parent P Hope plant. The symbols B^p and B^s respectively are proposed for the allelic boll surface characters, pitted and smooth.

228. The Effect of Environment on Fibre Maturity of Cotton. By A. N. Gulati. (*Ind. J. Agr. Sci.*, xi., **4**, 1941, p. 566.) The effect of environment, as provided by agronomical factors, on fibre maturity of cotton, for which material was kindly supplied by the Institute of Plant Industry, Indore, is described in this paper. The material consisted of two sets of samples. The first set consisted of samples of P-A/289F and Mollisoni cottons grown at Sriganganagar (Bikaner). The agronomical factors included in this experiment were: (i) Sowing dates in May and June, (ii) presence and absence of preparatory cultivation, (iii) heavy and moderate irrigations, (iv) cake, Nicifos and no-manure, and (v) 6-inch and 12-inch spacings. From a study of these results the following conclusions are drawn, which should be regarded as tentative owing to the small number of samples in this set: (1) Out of the two sowing dates, May suited P-A/289F, while June helped Mollisoni to attain its highest fibre maturity. (2) Preparatory

cultivation did not prove beneficial to either of the two cottons in respect of fibre maturity. Its absence, however, helped Mollisoni when it was June sown. (3) Heavy irrigation comprising 11 waterings as compared with moderate irrigation of 6 waterings was helpful in raising the fibre maturity of both the cottons. Heavy irrigation with May sowing formed a good combination for P-A/289F. (4) The application of Nicifos to P-A/289F was evidently better than no-manure when the cotton was sown in May, while cake and no-manure suited Mollisoni better than Nicifos. (5) Six-inch spacing as compared with 12-inch spacing improved the fibre maturity of Mollisoni.

The second set consisted of samples of Cambodia cotton grown in two Rajputana States—Bundi and Ajmere. The agronomical factors studied in this experiment were: (i) three sowing dates in March, May, and July, (ii) adequate and scanty irrigations, (iii) presence and absence of basal dressing of manure, and (iv) three top dressings of manure. The following conclusions are drawn from the results: (1) Locality has a significant effect upon maturity percentage, Ajmere yielding higher percentages of mature fibre as compared with Bundi. (2) The earlier-sown samples gave higher percentages of maturity in both the localities. Thus, sowing in March proved the best and sowing in July the worst in respect of this property. The bad effects of late sowing could, however, be remedied by heavy irrigation. (3) Adequate irrigation yielded higher fibre maturity than scanty irrigation. (4) The application of sheep dung at the rate of 32 mds. per acre plus ammonium sulphate at the rate of 50 lb. per acre as basal dressing had a depressing effect upon fibre maturity as compared with no basal dressing. (5) Top dressings with sheep dung alone (T_2) and sheep dung plus ammonium sulphate (T_3) as compared with no top dressing (T_1) had a beneficial effect upon maturity percentage, T_3 giving better results than T_2. Thus, the application at the same rate of the same manure—*i.e.*, sheep dung plus ammonium sulphate—did not prove beneficial as a basal dressing, but proved beneficial when applied as a top dressing.

229. Variation in the Measurable Characters of Cotton Fibres. II. Variation among Seeds within a Lock. By R. L. N. Iyengar. (*Ind. J. Agr. Sci.*, xi., 5, 1941, p. 703.) The following conclusions are presented: The mean fibre length is nearly constant in Co. 1. In Co. 2 it rises gradually from the first position to the last, while in K546 it rises up to about the middle of the lock and falls later on. The fibre weight per cm. does not indicate any variation in Co. 1 and Co. 2 except for a higher value in the first position. But a consistent fall from first to last position is noted in K546. The unit fibre weight shows no variation in Co. 1 and Co. 2, but exhibits a gradual fall in K546. The number of fibres per seed as well as the number per unit area gradually decreases towards the end of the lock. The rise noted from the first to the second position in the former character is absent in the latter. The variation in the maturity cannot be assessed definitely on account of the absence of complete data. A study of the inter-relationships among the different characters discloses the following points: The seed weight is positively associated with many of the characters, reflecting the general trend of all-round growth. The lint weight is more prominently associated with the number of fibres per seed than with the weight of the whole fibre in both Co. 1 and Co. 2. In K546, however, it is equally associated with both. The ginning percentage is strongly associated with the lint weight. The negative correlation of the ginning percentage with seed weight, generally reported by different workers among different varieties, is not confirmed in the present case among seeds within a lock. The unit fibre weight is more dependent on the weight per unit length than the length of the fibre.

[*Cf.* Abstr. **740**, Vol. XVI. of this Review.]

230. Asiatic Cottons: Linkage Relation of White Pollen Factor. By G. K. Govande. (*Ind. J. Agr. Sci.*, **10**, 1941, p. 842. From *Summ. Curr. Lit.*, xxi., 24, 1941, p. 630.) Coconada 45, a strain with white pollen, was crossed with both A8 Burma lasciniated and N6 multiple recessive in order to discover the linkage relations of the white pollen factor in Asiatic cottons. No back-cross data are available, but other results obtained are presented which show clear evidence of linkage between the white pollen and leaf nectaries with cross-over values of 18·3 per cent. and 14·7 per cent. in the F_2 and F_3 generations respectively. As regards other genes—namely, for petal colour, anthocyanin pigment, leaf shape and lint colour—the deviations from the expected ratio are not significant, indicating occurrence of free assortment.

231. Inheritance in Cotton. By D. T. Killough *et al.* (*53rd Ann. Rpt. Texas Agr. Exp. Sta.*, 1940, p. 63.) Experiments are being conducted to evolve hairy types of cotton which retain poison better in insect control and which may be used as stocks for further testing and comparison with the better commercial varieties.

The inheritance of leaf shape and colour and their effect on yields was investigated further, and the pure types combining the desired characteristics were grown for the purpose of obtaining seed for testing under field conditions to compare their yields with the yields of normal green-leaf stock used as the recurrent parent. Lines differing by only one main character—namely, okra-leaf, red-leaf, bronze-leaf, and virescent yellow leaf—have been developed through six generations of back-crossing to an inbred, normal Upland plant. If any of these lines do not differ significantly, it will indicate that the particular character has no adverse effect on yield, and consequently may be used as a genetic marker for transfer to a superior variety.

Fibre fineness and length in relation to the yield and cleaning qualities of cotton are studied in crosses between Lightning Express and strains with short, coarse fibres, and spinning tests of the new hybrid types will be carried out and the inheritance of the physical properties of the fibre investigated. Several very early maturing strains of cotton were obtained from Sodova, Bulgaria, and were crossed with some of the better Texas varieties for a study of the photoperiodic response to length of day and also of inheritance of earliness with other important economic characters.

232. Inheritance of Cluster Habit and its Linkage Relation with Anthocyanin Pigmentation in Upland Cotton. By J. Winston Neely. (*J. Agr. Res.*, **64**, 2, 1942, p. 105.) Crosses were made between two strains of Upland cotton characterized respectively by red plant, non-cluster habit (R_1^{RO}, R_1^{RO}, *Cl*, *Cl*) and green plant, cluster habit (r_1^{ro}, r_1^{ro}, *cl*, *cl*). Although the F_1 differed slightly from the non-cluster parent, the non-cluster characteristic is dominant, or practically so. In the F_2 and back-cross generations, good 3 : 1 and 1 : 1 ratios of non-cluster to cluster were obtained, verifying the previous conclusion that the characteristic is controlled by one genetic factor pair. Detailed studies in linkage detection and linkage estimation show that the R_1^{RO} and *Cl* genes belong to the same linkage group and that the percentage of recombinations under the conditions of this study is not far from 18·5. These results verify the previous reports regarding the existence of the linkage of the two genes. However, the recombination fraction determined in these studies is somewhat higher than that previously reported.

233. Green Lint Cotton: Wax Content. By C. M. Conrad. (*Sci.*, **94**, 1941, p. 113. From *J. Text. Inst.*, xxxii., **10**, 1941, A468.) The lint from *Gossypium hirsutum* (var. Arkansas green lint) differs from that of ordinary strains of Upland cotton not only in its bright green colour and soft feel, but

also in its remarkably high wax content of 14-17 per cent. based on the dry weight, compared with 0·4-0·7 per cent. for most cotton lint. The wax may be removed readily from green lint cotton with hot ethyl alcohol, chloroform and other organic solvents, and is also soluble in acetic acid and cold pyridine. With alcohol and most other solvents the hot extract is coloured deep amber in transmitted light, but fluoresces a deep velvety green in reflected light. The green colour of the lint is not changed appreciably, if at all, by the extraction. When the hot alcoholic solution cools to 50°-55° C. most of the wax separates in poorly defined yellow crystalline flakes which are noticeably anisotropic between crossed nicols. The crude wax can be separated into at least three fractions of different properties by means of 95 per cent. ethyl alcohol and ethyl ether at room temperature. X-ray diffraction patterns show that at least a part of the wax occurs in a crystalline form in the fibre, and is highly oriented, the most prominent diffraction arcs arising from crystal planes perpendicular to the fibre axis. Microscopic observation of the fibres in longitudinal mount or of their cross-sections does not reveal definitely the location of the wax. In cross-section an outer greenish translucent ring which constitutes one-third to one-fourth of the thickness of the wall may be observed on sharply focussing. When the fibre cross-sections are strongly swollen with cuprammonium solution a number of similar greenish translucent concentric rings may be seen throughout the wall.

234. A NOTE ON DETERIORATION AND ACCLIMATIZATION OF STRAINS. By K. Ramiah and P. D. Gadkari. (Ind. Cent. Cott. Comm., 2nd Conf. Sci. Res. Wkrs. Cott. India, *Genet. and Pl. Bre. Paper No. 16*. From *Pl. Bre. Absts.*, xii., **1**, 1942, p. 10.) Deterioration of a particular strain or variety of cotton under cultivation may be due to either non-genetic or genetic causes. In the non-genetic causes the authors include mechanical mixture of seeds, natural crossing in fields, and extension of the cultivation to areas not particularly suited to that variety. The genetic causes for deterioration are grouped under either segregation or mutation and selection pressure. It is pointed out that strains released for distribution consist of several genotypes differing in their constitution as regards many physiological characters. Acclimatization is discussed in the second part of the article. It is suggested that acclimatization must mean the existence of genetic variability in the material and the consequent selective action of environment on the more favourable genotypes. The "New Place Effect" refers primarily to the temporary and permanent changes, peculiar to the place alone, suffered by the strain in response to a new environment.

235. A TECHNICAL METHOD OF SELECTION IN COTTON FOR IMMUNITY AGAINST WILT. By T. Fahmi. (*Egypt. Agr. Rev.*, **19**, 1941, p. 6. From *Pl. Bre. Absts.*, xii., **1**, 1942, p. 59.) The author describes a method adopted for breeding immune strains which combine high yield and better qualities. Seedlings are planted in pots containing contaminated soil; these pots are kept for 40 days in a greenhouse the temperature of which is 25° C. Afterwards the plants apparently immune are transplanted in the field, where they are bred for several generations until immune strains of high qualities and of uniform genetical constitution are produced. The author places great importance on the stock used for selection. The most appropriate stock is produced by artificial hybridization between immune and non-immune varieties carefully selected for the purpose. The author concluded that those healthy exceptional plants which exist among non-immune strains when used as stock for selecting and breeding for immunity are often unsuccessful.

236. RUSSIA: NEW WILT-RESISTANT LINES OF UPLAND. By I. Veli-Zade. (*Sovetskii Khlopok*, **4**, 1940, p. 39. From *Pl. Bre. Absts.*, xi., **4**, 1941, p. 307.) Selections combining resistance to *Verticillium* wilt with high lint length and

ginning percentage have been obtained. Line 01363 also has lint of exceptional strength and has beaten the best Upland varieties in yield of lint. Line 01367 was selected from variety 114, from which it differs in lint length (32·2 mm. against 29·4 mm.), larger bolls, and 28 per cent. better survival on wilt-infected soil. Even those plants that contract the malady do so only at the end of the growing season, and not at the period of major attack.

237. A Statistical Study of the Relation between Quality and Return per Acre in Cotton. By V. G. Panse. (*Ind. J. Agr. Sci.*, xi., **4**, 1941, p. 546.) The relationship between quality and price has been studied in data of spinning tests and commercial valuations of samples grown in Malwa over a period of 8 years from 1931 to 1938. It has been shown that the premium for quality is small, and this result has been confirmed by an examination of other Indian cottons. Yield, therefore, should receive primary consideration when introducing superior cottons. Cambodia cotton has been compared with local *desi* cotton and Malvi 9 for yield and money return per acre. It has been shown that Cambodia, in spite of its superior quality, cannot be recommended to the cultivators on account of its lower yield. The effect of the relationship between quality and price on cotton breeding policy has been discussed, and it has been pointed out that a premium for quality adequate to compensate for more than quite a small loss in yield is not ordinarily realized. Therefore, yield and ginning percentage must be taken into account in breeding for superior quality.

238. Studies on the Periodic Partial Failures of Punjab-American Cotton in the Punjab. III. The Uptake and the Distribution of Minerals in the Cotton Plant. By R. H. Dastur and A. Ahad. (*Ind. J. Agr. Sci.*, xi., **2**, 1941, p. 279.) *Summary.* The mineral composition of the different parts of the Punjab-American (4F) and *desi* (Mollisoni) cotton plants at fortnightly intervals is studied with the ultimate object of determining the nature of the nutritional disorder that sets in in the American plants when they suffer from "*tirak*" (bad opening) disease in the Punjab. The quantities of different minerals in the American plant are as under, on percentage dry matter: 2·2 gm. of CaO, 2·1 gm. of K_2O, 1·7 gm. of N_2, 1·5 gm. of SO_4, 0·35 gm. of P_2O_5, 0·44 gm. of MgO, 0·32 gm. of Cl_2, and 0·06 gm. of $Al_2O_3+Fe_2O_3$. The mineral composition of the *desi* plant is the same except that there is less of K_2O (1·7 gm.) and more of CaO (2·4 gm.) and SO_4 (1·7 gm.) in this variety as compared with the American plant. The percentage composition of ash of the two varieties shows the same differences as stated above. Leaves and bolls contain largest amounts of all minerals. The leaves contain more potash than the bolls in the American, while the reverse is the case in the *desi* variety. The mineral contents of the bolls of the *desi* plants are higher than those of the bolls of the American plant. Percentages of lime and sulphates in dry matter of the roots, stems, and leaves remain nearly constant in both varieties at all stages of growth. Nitrogen, phosphoric acid and iron contents of the leaves diminish, while potash diminishes more in the stem and root than in the leaves. The remaining minerals diminish in all the parts as the plant matures. Thus the demand of the bolls for lime and sulphates appears to be met directly from the soil, and for potash it is met mostly from the stems and roots and partly from the leaves in the *desi* plant only. Nitrogen, phosphoric acid and iron travel to the bolls from the leaves, and the remaining minerals from all parts of the plant to the bolls. The maximum uptake of all minerals occurs at the flowering stages in both the varieties, the peak of the maximum being reached by the middle of September in American and the end of September in *desi*. This is the period when the maximum increases in the dry weights of the plants are also found to occur in both the varieties. The study of the distribution of minerals and nitrogen in different parts of the

plants shows that the bolls of the *desi* plant contain more of each mineral than the leaves, while the leaves of the American plant at maturity contain greater percentages of the total minerals than the bolls. Thus, the important minerals like potash, magnesia, phosphoric acid, iron and aluminium, and chlorides remain accumulated in the leaves of the American plant. This is not so in the *desi* plant. This difference between the two varieties may be due to the greater percentage of dry matter of the bolls per plant in *desi* than in American. The concentrations of nitrogen in the bolls and leaves in the two varieties are nearly the same. The percentages of total nitrogen in the leaves of both varieties at maturity are also equal.

IV. Relation between Nitrogen Deficiency and Accumulation of Tannins in Leaves. By R. H. Dastur. (*Ind. J. Agr. Sci.*, xi., 2, 1941, p. 301.) Formation of tannin deposits in the mesophyll cells of the leaves of the 4F Punjab-American cotton plants, which later developed premature yellowing and shedding of leaves and bad opening of the bolls, was described in a previous paper by the author. In the cotton season of 1937-38, whilst making periodic examination of the leaves, it was noticed that these deposits were absent in plants from plots treated with ammonium sulphate, while they were present in the leaves of plants from the control plots and from plots manured with potash and superphosphate. It was, therefore, decided to investigate the possible relationship between the formation of tannins in leaves and their total nitrogen content in the season of 1938-39. Microscopic method for testing the presence of tannins in leaves was replaced by a chemical method. Leaves of plants from two field experiments, in which nitrogenous fertilizers were among the treatments, were tested periodically for tannins, and it was found that a test for tannins was given by the leaves of plants from the control plots by the beginning of September, while the test was negative in leaves of plants from plots manured with nitrogenous fertilizers. Analysis of the leaves for total nitrogen showed that the nitrogen content of the leaves giving a negative test was significantly higher than the nitrogen content of the leaves giving a positive test. Similarly the yield and the opening of the bolls—*i.e.*, weights of seed cotton per boll—were higher on the manured plots than on the control plots. The above relationship between tannin and nitrogen deficiency was again confirmed in the cotton season of 1939-40. A positive tannin test was generally given by leaves whose nitrogen content was in the neighbourhood of 2·5 per cent. of the dry matter. By sowing the cotton crop later than the normal practice tannins developed later in the leaves than in the leaves of early-sown plants. The analysis of the leaves under different sowing dates again confirmed the same relationship between the nitrogen content of the leaves and tannins. A positive test for tannins in leaves of the cotton plant in the Punjab at its flowering phase (August-September) is thus an index of nitrogen deficiency at that stage. This fact was made use of in detecting and remedying the nitrogen deficiency in cotton crops during the 1939-40 season. The test for tannins was made in 45 fields located in different districts in the third and fourth weeks in August. Whenever a positive test was recorded, sulphate of ammonia at the rate of 2 mds. per acre was applied. Controls were also included. The fertilizer was also applied in some fields where a negative test was given. In the former case the response to the fertilizer was high and profitable, while in the latter the response was either nil or low and was uneconomic. The practical possibilities of this test are discussed.

[*Cf.* Abstr. 724, Vol. XVI. of this Review.]

239. Colchicine to Aid the Plant Breeder. By S. Bettoney. (*Missouri Bot. Gard. Bull.*, 28, 1940, p. 119. From *Pl. Bre. Absts.*, xi., 4, 1941, p. 263.) A popular account of the use of colchicine for chromosome doubling.

240. A New Method of Plant Breeding. By J. W. Boyes. (*Pr. Bull. Dpt. Ext. Univ., Alberta*, 26, 1941, p. 5. From *Pl. Bre. Absts.*, xii., 1, 1942, p. 1.) A popular account of the production of polyploids by colchicine, etc., and of the possible uses of induced polyploidy in plant breeding.

241. Methods of Detecting Polyploid Plants at Different Stages of Development. By L. P. Breslavez. (*Bull. Acad. Sci.*, Ser. Biol., No. 5, U.S.S.R., 1940, p. 706. From *Pl. Bre. Absts.*, xi., 4, 1941, p. 272.) Irregularities of development of the cotyledons or of the first foliage leaves, anomalous branching of the axis of the seedling, and such pronounced deformities are not the only ways of recognizing polyploid plants, nor are they infallible signs of polyploidy. Other methods referred to include determining the size of the stomata, in illustration of which tabulated data are given; various exceptions are also mentioned. In using this method it is recommended that the mean dimensions of the stomata on 10 control plants be taken for comparison; that all leaves should be taken at the same stage of development, and examinations be made on the same regions of the leaf, the lower epidermis being preferred to the upper, since it is less liable to be damaged; that both the breadth and length of the guard cells be measured and the area of the stomata be calculated—this gives a much more sensitive index than either the length or breadth alone. Other features of polyploids are the irregular form of the cells adjacent to the stomata, the larger nuclei of the epidermal cells, the larger number of nucleoli, which are often of an unusual form, and the larger pollen. No single one of these criteria is infallible, but when a number are taken together a high degree of certainty may be obtained. The only final criterion is the nature of the progeny.

FIBRES, YARNS, SPINNING, WEAVING, ETC.

242. Cellulosic Materials: Acid Hydrolysis. By R. F. Nickerson. (*Ind. Eng. Chem.*, 33, 1941, p. 1022. From *J. Text. Inst.*, xxxii., 11, 1941, A518.) Data on the hydrolysis of linen, cotton, mercerized cotton, wood pulps, viscose and cuprammonium rayons, cellulose acetate and methylcellulose, in boiling 8 per cent. hydrochloric acid are presented and discussed. The method used was based on measurements of the evolution of carbon dioxide from the glucose set free during hydrolysis with the acid. Curves showing percentages of cellulose hydrolyzed with time indicate that, initially, varying amounts of the celluloses are hydrolyzed rapidly to glucose, but that later the residual cellulose becomes more and more resistant to breakdown by acid. The solid still present after refluxing cotton for 7 hours with acid was filtered, washed thoroughly, dried and examined. A photomicrograph revealed that it consisted entirely of broken cotton fibres. X-ray diagrams of this material and of a mat of unhydrolyzed cotton are identical and demonstrate that, under the conditions employed, hydrolysis does not alter the crystalline pattern appreciably. These results indicate that cellulose probably consists almost entirely of chains of anhydro-glucose units in varying degrees of association, ranging from a dense, crystalline, acid-resistant fraction to an amorphous, easily-hydrolyzed fraction. Mercerization, dispersion in cuprammonium hydroxide solution, and treatment by the viscose process reduce the quantity of resistant cellulose.

243. Über das Verhalten von Cellulose bei der Druckerhitzung in Alkoholwassermischungen. By T. Kleinert. (*Cellulosechemie*, 18, 5, 1940, p. 114. From *Cott. Lit.*, December, 1941, p. 511.) Unbleached cotton and cotton linters were heated with alcohol-water mixtures in sealed glass tubes at 180° C. for 4 hours. The cellulosic material emerged from the treatments with mixtures rich in water with a slightly brownish colour, whereas it appeared pure

white after treatment with alcohol alone. Linters heated in water alone became brittle and could be converted into fragments when rubbed between fingers. On the other hand, cotton heated in alcohol and alcohol-water mixtures rich in alcohol retained its original strength properties. Heating with water alone decreased the alpha-cellulose content of cotton to 92·2 per cent. and of cotton linters to 52·6 per cent.; these figures increased as the alcohol portion of the mixture was increased. In pure alcohol almost no attack takes place. Obviously alcohol decreased the hydrolytic effect of the water.

244. Pectic Substances in Cotton. By F. Leger and P. Larose. (*Canad. Jnl. Res.*, **19**, 2, 1941, p. 61. From *Cott. Lit.*, July, 1941, p. 287.) The quantitative distribution of pectic substances in raw cotton has been studied. A new method for the removal of cuticle pectin has been utilized. A combination of this method with analysis for a-cellulose has shown that the non-cellulosic material in undamaged cotton appears to be present in the form of pectin. In direct support of recent work carried out by Harris and co-workers . . . and in contrast to that published by Farr . . . it has been found that reduction of pectin content from 1·18 to 0·12 per cent. resulted in a change of fluidity from 1·93 to 2·08, whereas treatment with hydrochloric acid raised the fluidity to 25·8. It is suggested that there is no essential chemical difference between pectin in the cuticle surrounding the fibre and that distributed throughout the fibre.

245. New Technique developed in measuring the Diameter of the Cotton Fibre. By J. H. Moore. (*J. Amer. Soc. Agron.*, **33**, 2, 1941, p. 183. From *Exp. Sta. Rec.*, **85**, 2, 1941, p. 282.) Methods used to measure diameter of cotton fibres were modified in efforts to make the work less tedious and more accurate. Mercerized mature fibres are now stained in Congo red before drying and diameters as projected on white paper are measured directly with a celluloid metric rule.

[*Cf.* Abstr. **293**, Vol. XVII. of this Review.]

246. Cotton Fibre: Formation of Cellulose Particles in. By W. K. Farr. (*Rayon Text. Mnthly.*, **22**, 1941, p. 519. From *Summ. Curr. Lit.*, xxi., **23**, 1941, p. 597.) The development of the cotton fibre is discussed and an explanation of the mode of formation of cellulose particles in the living fibre is presented. It is stated that the cellulose-forming plastids in the fibre increase in number by direct division before the synthesis of cellulose begins, and that the first evidence of cellulose formation is in an outer part of the plasma of the small plastids. If the plastid membrane is punctured at this period of ring development, the ring material flows out through the opening in the form of a liquid. From this liquid state it gradually passes through a gel state to that of a solid form, which finally fractures directly to form the cellulose particles. The small plastid, with the first-formed cellulose particles suspended in the plasma, then enlarges and a new cellulose ring, greater in diameter but equal in thickness, is formed by a repetition of the method just described. This ring, in turn, fractures into particles. The plastid again increases in size, and the process is repeated again and again. The mature plastid finally bursts and releases the full-formed cellulose crystallites, surrounded by the plastid plasma, into the protoplasm of the fibre cell. Later, the particles orient end to end in single rows to form fibrils, and, with their associated colloidal material of plastid and protoplasmic origin, are deposited in successive lamellæ to form the "secondary" portion of the cell membrane. It is pointed out that this mechanism of cellulose formation has no apparent points in common with the mechanism of starch formation, and that in cells of the cotton leaf, stem, or boll, where both starch and cellulose

are being formed, the syntheses take place in different plastids in the same cell. Series of photomicrographs showing starch formation and cellulose formation are given.

247. COTTON FIBRE: DEVELOPMENT. By K. Hess. (*Klepzig's Textil-Z.*, **44**, 1941, p. 253. From *Summ. Curr. Lit.*, xxi., **23**, 1941, p. 597.) The early stages in the growth of the cotton fibre are discussed with reference to the pectin and wax contents, the epidermis of the seed (as revealed in polarized light), and places of localized heavy growth (with high negative double refraction, as seen before and after treatment with chloroform). The conclusion is drawn that further improvement in rayon will demand some attempt to simulate the growth of the natural fibre, including the incorporation of materials to secure lack of homogeneity.

248. FIBRE MATURITY IN RELATION TO GROUP LENGTHS OF SOME COTTONS GROWN IN THE PUNJAB. By S. Rajaraman. (*Ind. J. Agr. Sci.*, xi., **2**, 1941, p. 177.) Eleven varieties of cotton grown in the Punjab were analyzed into different length grades with a Balls Sledge sorter, and the fibres in each length grade were tested for maturity. Statistical analysis was applied to eight varieties only, and all of them were improved P-A cottons with medium staple lengths. Of the other three, one was the *desi* cotton, 39 Mollisoni, another a new cross, Jubilee, and the third was P-A 4F, and all of these were much shorter in staple. The analysis showed that for the eight varieties the three maturity terms—percentage of mature fibres (M), maturity coefficient (C), and maturity index (MI)—varied with group length (l) in a manner which was described by the three regression equations:

$$M = 75{\cdot}734 - 7{\cdot}681\,l + 0{\cdot}620\,l^2$$
$$C = 0{\cdot}9061 - 0{\cdot}02661\,l + 0{\cdot}002410\,l^2$$
$$MI = 0{\cdot}8342 - 0{\cdot}04834\,l + 0{\cdot}004269\,l^2$$

where l is in units of $\frac{1}{8}$ inch. As the group length increases from $\frac{3}{8}$ to $\frac{6}{8}$ inch the mean percentage of mature fibres (and also maturity coefficient and maturity index) decreases, but further increase of group length is accompanied by an increase of the mean maturity terms. This confirms the statement made by Gulati and Ahmad that the correlation coefficient between spinning value and percentage of mature fibres is negative for short-staple cottons and positive for medium- and long-staple cottons.

249. BEHAVIOUR OF COTTON FIBRE WITH AMMONIUM OXALATE AND CUPRAMMONIUM SOLUTION. By E. Heuser and J. W. Green. (*Indus. and Eng. Chem.*, **33**, 7, 1941, p. 868. From *Cott. Lit.*, November, 1941, p. 466.) The conclusions may be drawn that the existence of Farr's cementing material as a fundamental constituent of the cotton fibre is rather improbable, and that the viscosity of a solution of the cotton fibre is a property of the entire fibre and not of a problematical cementing material alone.

250. COTTON FIBRES: FINENESS MEASUREMENTS. By M. A. Grimes. (*Text. Res.*, **11**, 1941, p. 459. From *Summ. Curr. Lit.*, xxi., **22**, 1941, p. 567.) The fineness of the fibres of each of five cottons has been determined by measurements of the ribbon width of the fibres in their natural state, the width in sodium hydroxide, the width after mercerization without tension, the weight per unit length, and the area of cross-sections. The results are tabulated and discussed. The order of the cottons with respect to fineness is not the same by all methods. The significance of differences between the cottons, and correlation coefficients between area and weight per inch, weights and widths, etc., are discussed. The conclusion is drawn that small differences in fineness may not be determined

with certainty, but that wide differences may be detected by any of the methods used. It is suggested that the choice of method might be made on the basis of the information desired—*i.e.*, whether it is the area the fibre occupies or the quantity of material present in the fibre—and on the relation of each type of fineness to the spinning value.

251. Electrical Insulation Cotton: Production. By C. Seyd. (*Textilberichte*, **22**, 1941, p. 208. From *Summ. Curr. Lit.*, xxii., **2**, 1942, p. 36.) The electrical conductivity of cotton is ascribed largely to the potassium carbonate naturally present. This can be removed by washing with soft water. If hard water is used, several rinsings are necessary.

252. Der Einfluss der Belichtung Weisser und Gefärbter Vegetabilischer und Animalischer Fasern auf deren Histologischen Aufbau. By R. Haller. (*Mell. Textilberichte*, **21**, 7, 1940, p. 352. From *Cott. Lit.*, August, 1941, p. 331.) Raw undyed cotton exposed four weeks to intense sunlight no longer gave the characteristic reactions with cuprammonium or copper ethylenediamine; it also showed uneven swelling in sodium hydroxide solution, in contrast to the uniform swelling of non-illuminated samples.

253. Cotton: Primary Sorption of Water. By S. M. Neale and W. A. Stringfellow. (*Trans. Faraday Soc.*, **37**, 1941, p. 525. From *Summ. Curr. Lit.*, xxi., **21**, 1941, p. 526.) An account is given of investigations of the sorption of water vapour by bleached cotton yarn at pressures below 1 mm. Hg. The experiments cover sorptions up to 1·5 mg./g. It is probable that only primary sorption is involved in this region. The differential heat of sorption is constant over this range at 15·7 k. cal. per g. mole. To account for this value it is suggested that in the stage of primary sorption each water molecule is directly linked to a pair of suitably spaced cellulose OH groups in the non-crystalline region. As the sorption of water by cellulose increases beyond the primary stage, secondary linkages between incoming molecules and others already linked with cellulose OH groups will occur. Some of the oxygen atoms will then engage more than one extra-distant hydrogen atom, and the bond energy will fall, as reflected in the falling heat of adsorption. Finally, towards saturation, incoming water molecules will be able to condense only on already heavily water-covered surfaces, and the thermodynamics of the process will gradually approach those of condensation in bulk. (Latent heat at 20° C.=10·5 k. cal./mole.)

254. Fumigation of Wet Cotton with Methyl Bromide. By H. A. U. Monro and R. Delisle. (*Sci. Agr.*, **21**, 9, 1941, p. 584. From *Exp. Sta. Rec.*, **85**, 6, 1941, p. 788.) In the work reported methyl bromide in a vacuum-dissipated treatment of two hours at a dosage of 2·5 lb. per 1,000 cu. ft. at a temperature of 80° F. was completely toxic to adult granary weevils and European cornborer larvæ placed in bales of wet cotton. After this treatment the gas was rapidly removed by routine ventilation methods. This treatment involved no hazards to workmen or others in the proximity of the fumigated bales.

255. Cotton Yarns: Breaking Load and Elongation. By H. F. Schiefer and R. S. Cleveland. (*J. Res. Nat. Bur. Stnds.*, **27**, 1941, p. 325. From *Summ. Curr. Lit.*, xxi., **24**, 1941, p. 626.) Results are reported of single-strand tests of the breaking load and elongation of cotton yarns varying in count and spun with four twist factors. Pendulum and inclined-plane types of testing machines and two rates of loading were used. The results give information regarding the corrections of these machines, variability of the yarns, and the number of tests required for a given precision and probability. The effect of rate of loading on the breaking load and elongation is discussed.

256. Cotton Yarns: Moisture Regain. Div. of Tr. Standards, U.S. Nat. Bur. of Standards. (*Rayon Text. Mnthly,* **22,** 1941, p. 448. From *Summ. Curr. Lit.*, xxi., **21,** 1941, p. 528.) A new regain standard, "Commercial Standard CS 11/41," operative from August 1, 1941, is reproduced. The following are the special features: (1) Dry weight is defined as that reached in an oven at 105°-110° C. when two consecutive weighings taken not less than ten minutes apart do not differ by more than 0·1 per cent. of the first of the two weighings. (2) The commercial moisture regain of unmercerized cotton yarn shall be 7 per cent. (3) The regain for mercerized cotton yarn shall be 8½ per cent. (4) A tolerance of ±1 per cent. is allowed on invoice weights.

257. Moisture Relations of Textile Fibres at Elevated Temperatures. By J. G. Wiegerink. (*J. Res. Nat. Bur. Standards,* U.S., **24,** 6, 1940, p. 645. From *Exp. Sta. Rec.*, **85,** 3, 1941, p. 429.) The moisture contents of ten kinds of textile fibres in the form of specially prepared yarns were determined when the fibres were in equilibrium with air for a series of relative humidities and temperatures. Data were obtained for both "desorption" and "adsorption," the yarns being brought to equilibrium from a wet condition and a dry condition respectively. The fibres studied were raw, purified and mercerized cotton; clothing and carpet wool; viscose and cuprammonium rayon; raw and degummed silk; and cellulose acetate. The temperatures ranged from 96° to 302° F., and the relative humidities ranged from 5 to 90 per cent. for temperatures below 212° and up to the maximum obtainable at atmospheric pressure above 212°. The results are given in the form of graphs showing moisture content against relative humidity, and also in the form of graphs in which the logarithms of the moisture contents at given relative humidities are plotted against the reciprocals of the corresponding absolute temperatures. The last show straight-line relationships with changes in the slopes of the lines between 200° and 220°.

258. Cotton Yarn: Partial Acetylation. By Z. A. Rogovin and M. O. Sverdlin. (*Org. Chem. Ind.*, **7,** p. 253, U.S.S.R., 1940. From *J. Text. Inst.*, xxxii., **11,** 1941, A512.) The authors report on the influence of the catalyst and the diluent in the partial acetylation of cotton yarn, and recommend the following procedure: The yarn is scoured with 1 to 2 per cent. caustic soda (open boil) and bleached; time 3 hours, temperature 35° C., ratio of yarn to liquor 1 : 18 or 20; acetylating mixture acetic anhydride 20, acetic acid 80, perchloric acid 0·4 per cent. on the weight of the yarn.

259. Cotton Yarn: Shrinkage. By G. S. Kasbekar. (*Ind. Text. J.*, **52,** 1941, p. 18. From *Summ. Curr. Lit.*, xxii., **2,** 1942, p. 38.) The effects of solutions of acids, alkalis and salts on the dimensions, appearance, and dyeing and other properties of cotton fibres, yarns and fabrics, and the use of such reagents in mercerizing and finishing processes are briefly discussed. Results obtained in a systematic study of the shrinkage of bleached cotton yarn in zinc chloride, calcium thiocyanate, and sulphuric and phosphoric acid solutions are described. Tables show maximum percentage shrinkage and time for maximum shrinkage in solutions of various concentrations at 25° C. In each case as the concentration of the solution increases the shrinkage of the yarn increases, reaches a maximum, and then begins to decrease. The importance of the time factor in industrial applications is pointed out.

260. The Chemical Processing of Indian Cotton Materials. Pt. I. The Effect of Kier Boiling and Bleaching on the Cuprammonium Fluidity and Strength of Yarns Spun from Four Good Quality Indian Cottons. By N. Ahmad *et al.* (*Tech. Bull.*, Ser. B, No. 29, Ind. Cent. Cott. Comm., 1941.) Four Indian cottons of the 1934-35 season (Jayawant, Cambodia Co. 2, Surat

1027 A.L.F., and P.A.289F) were spun to 24's by identical processes and submitted to a series of kier boils in an experimental kier, the treatments involving the use of caustic soda of various concentrations, of organic solvent emulsions, of wetting agents, and both open and pressure boiling. Yarn kier boiled under one set of conditions was also bleached and soured under standard conditions. The samples were then examined for fluidity in cuprammonium solution and strength. The results indicated *inter alia* that the concentration of caustic soda in a pressure boil is not a significant factor so far as the degradation of the cotton is concerned. On the other hand, an open boil with soap and soda ash gave consistently high fluidity values and low tensile strength. The effects on fluidity and on strength did not, however, always run parallel. Considering the treatments from the point of view of the cottons, Cambodia exhibited the least and 289F the highest degree of degradation as indicated both by the fluidity and the strength. The fluidities of the bleached samples were in all cases significantly higher than those of the unbleached samples, but the strength tests did not disclose a similar effect.

261. The Breaking Strength of Fabrics. By P. Larose. (*J. Text. Inst.*, xxxii., **9**, 1941, T167.) Two types of tests are widely used for determining the breaking strength of fabrics—the " strip " test and the " grab " test. The former method is generally recognized as giving the more reliable and accurate results, but the latter is faster and easier to carry out. The purpose of this paper is " to present additional results in regard to the relation between the grab test and strip test results and to propose a new method possessing the advantages of the strip and grab methods."

262. " Short-Cut " Cotton Spinning Preparation. (*Text. Manufr.*, October, 1941, p. 326.) Brief notes are given of the following systems of shortened cotton-spinning processes which are successful with due precautions under suitable conditions: *Graduated-draft speed frames*, omitting one speed-frame process; *high-draft speed frames*, omitting slubbing and intermediate frames; *lap draw-frame system*, reducing the draw-frame processes to one; *half-weight sliver system*, in which the sliver from the third head of drawing is divided into two groups and the half-slivers put up at the intermediate or high-draft speed frames.

263. Irrigated Cotton: Spinning Quality. Southern Text. Assoc. (*Cotton*, U.S., **105**, 1941, No. 11, p. 77. From *Summ. Curr. Lit.*, xxii., **3**, 1942, p. 59.) In the course of a general discussion on spinning and weaving problems it is reported that irrigated cotton gives trouble in carding and combing and may give rise to dyeing defects if mixed with rain-grown Delta cotton.

264. Relative Yarn Strengths using Casablancas and Three-Line Draft Systems at the Speed Frames. By H. A. Hancock and F. Dunkerley. (*J. Text. Inst.*, xxxii., **9**, 1941, T193.) Spinning-test results, using ordinary draft systems at the speed frames, with rollers reset for each cotton, are compared against tests using Casablancas apron system at the speed frames, working at a fixed setting for all Egyptian cottons. The ranking order of samples is found to be closely similar whichever draft system is used, to the advantage of the apron system because its testing technique is faster. A small displacement of values is noticed with combed staples processed by the apron system, an effect ascribed chiefly to the higher regularity of combed cotton; but the effect is of negligible importance over the range of staple irregularity found in Egyptian raw cottons.

265. Roller Settings and Yarn Strengths. By F. Dunkerley. (*J. Text. Inst.*, xxxii., **9**, 1941, T179.) The experimental evidence presented in this paper

is drawn from the results of over 1,000 spinning tests, conducted equally on 18 different types of Egyptian cottons, and from the breaking of more than 20,000 leas. The objects were: (i) To find out the effects on resulting yarn strengths of changes in roller settings at slubber, intermediate, rover, and ring frames separately; (ii) the settings for maximum strength having been ascertained, to find out how these maximum settings could be related to staple length; (iii) comparing Casablancas apron systems with three-line and light-middle-top-roller systems, using the same drafts and speeds for both, to find out by how much did these roller systems differ in sensitivity to changes in roller settings distances.

The results obtained may be stated as follows: (*a*) Small changes in roller settings have little effect on yarn strength; especially when roller settings are made wider than the optimum, but if errors in settings are made at each stage, the cumulative effect may be quite appreciable. (*b*) Staple length as normally understood can be used as a guide to roller settings on the speed frames three-line roller systems. In the experiments here recorded, little loss in resulting yarn strength was found when the slubber and intermediate, using weighted three-line roller systems, had settings such that the distance between front and middle lines roller nips was equal to staple length plus 4/32 inch; the equivalent setting for the rover, using a self-weighted three-line roller system, was equal to staple length minus 2/32 inch. (*c*) The difference in sensitivity at each stage was found to be slight when considering settings up to 1/8 inch wider than the optimum, but the weighted three-line systems on slubber and intermediate showed serious losses in resulting yarn strengths for the weaker samples when the settings were very close; the fall in strength at close settings was absent from the Casablancas systems. In this sense, the weighted three-line systems were more sensitive to changes in roller setting distances than were the corresponding Casablancas systems.

[*Cf.* Abstr. 748, Vol. XIV. of this Review.]

266. STATISTICAL METHODS IN TEXTILE RESEARCH. THE DESIGN OF WEAVING EXPERIMENTS. By V. R. Main and L. H. C. Tippett. (*J. Text. Inst.*, xxxii., 11, 1941, T209.) Experiments have been conducted at the Shirley Institute for many years to measure the effects on warp breaks in weaving of conditions of the yarn preparation and loom settings, and attention has been paid in designing the experimental lay-out to reducing errors as far as possible and to measuring them, so that the statistical significance of the results can be tested. This paper gives a general account of the importance of the errors arising from various sources and discusses the most economical arrangement for various types of experiment. The designs and methods are similar to those originally developed for use in agricultural field trials. Most of the experiments have involved measuring differences in breakage rates between warps, which, during the experiment, are interchanged between looms to give a Latin square. A typical experiment is first described and analyzed in detail to show the various sources of error and introduce the variances that measure their effects. The next section summarizes the results of similar analyses for many experiments. In the final section the general question of the design of weaving experiments is discussed in the light of the results of the previous section. The conclusion is reached that a randomized block design to eliminate loom and associated variations is better than the Latin square design, and that for some kinds of experiments a " split-plot " design can be adopted with advantage. The error variance is a composite quantity made up of the effects of variations within pieces to which are added the effects of variations between pieces, and because of this there is an optimum piece-length which gives maximum precision for minimum cost;

this length is worked out to be 60 yards. There follows a discussion of the use of a transformation of the breakage rate results to make the error variance independent of the mean; owing to difficulties in the interpretation of results expressed in terms of the transformed variable, it is deemed inadvisable to use such a transformation. Finally, it is shown how interactions between various factors affect the generality of the results of an experiment, and how account should be taken of this in deciding the scale of replication. The main conclusion reached is that all experiments should be replicated as many times as possible.

267. Cotton Mills: Cleaning. Southern Text. Assen. (*Cotton*, U.S., **105**, No. 11, 1941, p. 72. From *Summ. Curr. Lit.*, xxii., **3**, 1942, p. 59.) The cleaning of blowing and spinning rooms and machines, tape frames, and weaving sheds is discussed, and the practice followed in several American mills is reported by managers. Considerations of safety are emphasized.

268. Cotton Pulps: Influence of Cuprammonium Viscosity on Beating. By D. M. Musser and H. C. Engel. (*Paper Tr. J.*, **113**, 1941, Tappi, 13-16. From *J. Text. Inst.*, xxxii., **10**, 1941, A485.) The use of cotton for paper-making is discussed and an account is given of investigations of the practicability of decreasing the beating time of cotton pulps by reducing their cuprammonium viscosities. Pulps were prepared from (1) American lint of 15/32 inch staple length, (2) second-cut linters, and (3) cottonseed hull fibres. The cooked fibres were bleached with hypochlorite solution at *p*H8 and the amount of chlorine was varied to give different pulp viscosities. Test sheets were prepared and their physical properties measured. Studies were made over a beating range sufficient to establish for a given viscosity the maximum tear factor, burst factor, and breaking length. Curves showing changes in properties with beating time and the relations between cuprammonium viscosity and hours of beating required to produce the highest tear factor, burst factor, and breaking length respectively are given. The curves show that the beating time required can be reduced by lowering the specific viscosities of the pulps to values below 10. In the less degraded state—*e.g.*, at specific viscosities of 20—and under identical conditions the lint pulps required more beating than the linters pulps and the latter more than the hull-fibre pulps, but the differences became smaller as the viscosities were reduced. The physical properties of paper made from the lint fibres are superior to those of paper made from linters and from hull fibres. Reducing the specific viscosity below 10 causes a decline in the quality of the paper produced, but the use of this method of reducing beating time requirements is feasible in the case of pulps made from cotton lint.

269. Cottonseed Hulls: Use in Phenolic Plastics. By F. Rosenthal. (*Ind. Eng. Chem.*, **33**, 1941, p. 980. From *J. Text. Inst.*, xxxii., **11**, 1941, A535.) Cottonseed hulls are a heterogeneous mixture of hull bran and fibre. The absorbing power of the hulls is a function of their particle size and fibre content. In a study of the suitability of such materials for use as fillers for phenolic moulding compounds hull bran samples were prepared of controlled particle sizes of 40, 60, 100, 150, 200, and finer than 200-mesh screen respectively, and moulding compounds were made by impregnating each of the samples with the same amount of identical phenolic resin. Compounds were also prepared from bran of various particle sizes containing 5, 10, 15 and 20 per cent. hull fibre respectively. Tests were made for impact strength, modulus of rupture, and modulus of elasticity. A maximum impact strength was obtained when the cottonseed hull filler had a particle size of 100 mesh and 10 per cent. fibre content. A maximum modulus of rupture was obtained with cottonseed hulls of 60 mesh and no fibre content. The modulus of elasticity seemed to vary in proportion

to the modulus of rupture. By controlling the particle size and fibre content it is possible to prepare phenolic cottonseed hull moulding compounds comparing favourably in strength characteristics with commercial phenolic compounds.

TRADE, PRICES, NEW USES, ETC.

270. Round the World with Cotton. By I. W. Duggan and P. W. Chapman. (*U.S. Dpt. Agr., Agr. Adjust. Admin., S. Div.*, 1941. From *Exp. Sta. Rec.*, **85**, 5, 1941, p. 680.) This publication presents "in simple, non-technical style a story of cotton at home and abroad. It uses easily understood words, photographs and charts to tell in entertaining fashion what has happened to cotton since its legendary origin in India 5,000 years ago."

271. World Cotton Supplies: Prospects. By Sir Homi Mehta. (*Ind. Text. J.*, **51**, 1941, p. 269. From *Summ. Curr. Lit.*, xxi., **24**, 1941, p. 614.) Progress in cotton production in America and in other countries is reviewed, past dependence on the United States is pointed out, and the lessening of this as a result of the great increase in outside growths in the last decade or two is noted. It is pointed out that future prospects will depend on price trend, the policy of the United States Government, the trend of international politics, and competition of other fibres. Conditions after the war are considered, and the hope is expressed that the inflation and subsequent depression experienced after the last war will be avoided.

272. Cotton Statistics. By J. A. Todd. (*Text. Manufr.*, lxvii., 1941, No. 802 and subsequent issues.) The twenty-fourth paper of this series (October) discusses the prospects of the American cotton crop and also the Indian crop for the present season. Tables are included giving Cotton Prices in New York and Bombay weekly from April 5, 1941; Supply and Distribution of American Cotton annually from 1929-30; U.S. Cotton Consumption by Varieties monthly from August, 1939; Area, Yield, and Price of the Indian Cotton Crop for Five-Year Periods from 1914-15 to 1939-40, and annually from that season. Figures of the World's Cotton Crops are also given for the same periods.

The next paper (November) deals with the following: American Exports; Empire Cotton Crops; South American Crops. Three tables are included giving the Season's History of the American Crop; Prices of Spot Cotton in Great Britain; Empire Cotton Crops for 1914-15, 1924-25, and 1929-30 onwards.

In the following article (December) the American cotton situation, the situation in India, and the prospects for cotton in South America are discussed, and four tables are included on the Supply and Distribution of all cotton in the U.S.A. from 1918-19 to 1940-41; Monthly Consumption of all cottons in the U.S.A. from August, 1938-39, to October, 1941-42; Government controlled Stocks in U.S.A. in 1941; Cotton Prices in New York and Bombay weekly from August 2 to November 22, 1941.

The prospects for production and consumption in 1941-42 are discussed in the next paper (January, 1942), and in the author's view the economic consequences of the world-wide war conflagration are: (1) Accumulating surpluses of raw cotton in most cotton-producing countries; (2) a further contraction in maritime commercial intercourse; and (3) progressive growth of an enormous potential demand for cotton textiles over the greater part of the world. The following tables are included: United Kingdom Exports of Cotton Yarns and the Board of Trade (Volume) Exports of Piece Goods quarterly from 1932 onwards; Season's History of the American Crop annually from 1935-36; Production of Commercial Cotton in the World (Garside's estimates) from 1938-39 onwards.

The next article (February) discusses far-reaching changes in the raw cotton section of the industry in this country, the situation in the United States, Egypt, and India, and the outlook in the South American States. A table is included showing Cotton Prices in New York and Bombay weekly from September 6, 1941, to January 24, 1942.

The article for March discusses the raw cotton position in Lancashire, United States developments, cotton in India, cotton legislation in Egypt, and the cotton position in the South American States. A table is included of the monthly consumption of cotton in the United States for the six months from August to January, 1939-40, 1940-41, and 1941-42.

273. Post-War Lancashire Cotton Industry. By T. Driver. (*Text. Manufr.*, January, 1942, p. 6.) Deals with the problems of post-war reconstruction and the possibility of re-equipment of cotton spinning mills, and organization of the industry and export trade.

274. Uses for Cotton. By D. M. Ellis. (*U.S. Dpt. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog.* 91, 1941. From *Exp. Sta. Rec.*, **85**, 6, 1941, p. 835.) A bibliography of 785 selected references in English, classified according to specific uses of cotton.

275. New Uses for Cotton Pulp. By F. C. Vilbrandt. (*Chron. Bot.*, vi., **5**, 1940, p. 97. From *Exp. Sta. Rec.*, **84**, 3, 1941, p. 293.) A brief record of the volume and nature of cotton consumption by pulp industries, a summary of researches on chemical pulp, and a bibliography relating to cotton processing.

REVIEW

276. Agriculture in the West Indies. ("Colonial No. 182," H.M. Stat. Office, 1942. Price 10s. net.) This publication, issued on behalf of the Colonial Office in relation to Colonial Development and Welfare in the West Indies, is compiled mainly from documents supplied to the West India Royal Commission, 1938-39, supplemented with material from recently published reports, and deals with the British colonies in or near the Caribbean region, including British Guiana and British Honduras. An introductory chapter supplies the local historical background, but does not, as would have been instructive, correlate this with the development of tropical agriculture in other parts of the world. This is followed, colony by colony, with a survey of agricultural conditions, an account of the various crop industries with recent statistics of production, and a description of existing agencies for agricultural organization.

The general picture which emerges is of an economy still based on a centuries-old tradition of production for export, balanced not only by the importation of manufactures, including almost the whole supply of timber, but of a large proportion of the food consumed. Agriculture was developed on the plantation system, first with slave and later with wage labour, and where, as happened during periods of depression, estates were broken up into small holdings, or where these were formed from Crown lands, the almost universal tendency has been for the peasant to follow the estate tradition and grow sugar-cane, or cacao, or bananas, or limes, or cotton for the existing export markets. The decline of values due to increasing competition or changing demand and the decline of productiveness due to soil depletion and plant diseases have made dependence on these industries precarious, and the economic situation has been greatly aggravated since the previous steady flow of emigration was arrested, with a consequent rapid increase of local population. The needed remedy, as seen by the Royal Commission, is more intensive use of the land with increased production of food, coupled with the development of peasant agriculture.

That intensive cultivation, the fuller use of land, and the increase of peasant holdings will not in themselves suffice is shown by the example of Barbados, where cultivation is admittedly intensive and complete. This has resulted in the development of a dense population particularly dependent on imported food and fuel, and this is true in degree of peasant as well as planter. So far as an export economy on the old lines cannot meet the present or future situation the need will impose itself to make food production a first charge on the land, and cash crops an adjunct when this has been satisfied.

Of the cash crops introduced as alternatives or supplements to sugar-cane the most successful, over the period beginning with the present century, has been Sea Island cotton. About two-thirds of the crop is produced in the Leeward Islands: Montserrat, St. Kitts-Nevis, Antigua, Anguilla, and the Virgin Islands; the remaining third, of specially high grade, in St. Vincent. The St. Kitts crop is grown as a catch crop on sugar estates; elsewhere small-holders predominate, though there is a considerable amount of estate cultivation in Montserrat and St. Vincent. In Barbados, where both estate and peasant cultivation flourished in the early part of the period, the industry has now fallen to very small proportions.

The West Indian Sea Island Cotton Association was formed in 1933 to promote and protect the industry and to develop demand for the product, and is maintained by an export cess on cotton lint. The Association estimates annually the capacity of the market to absorb supplies during the coming season, and by advising the Governments concerned, secures the limitation of acreage to the appropriate extent.

Two general chapters of the publication deal with agricultural education and with intra-colonial agricultural organizations. Under education an account is given of the Imperial College of Tropical Agriculture in Trinidad, and of its functions in providing instruction and conducting research. The courses which have special local application are the three-year diploma courses in West Indian agriculture and sugar technology respectively. Outstanding research activities are the Cacao Research Scheme, the Low Temperature Research on the storage and transport of fruit and vegetables, the investigations of the Chemical Department on tropical soils, and of the Department of Sugar Technology on improvement in sugar manufacture. (Another activity which deserves specific mention is the pioneer work on banana breeding.)

The Farm School in Jamaica supplies working instruction over a wide range of agricultural practice, and has been in existence for twenty-six years. A system of agricultural apprenticeship in the work of Government experiment stations and nurseries, once more general, persists in three colonies. Agricultural science is included in the subjects taught in secondary schools, and two modern secondary schools with an agricultural bias have been started in Jamaica.

In addition to the Cotton Association already noticed, the following agricultural organizations have been established: a Sugar-Cane Breeding Station in Barbados, a West Indies Plant Quarantine Committee which maintains a Quarantine Station at the Imperial College in Trinidad, and Fruit and Vegetable Councils for the eastern and western groups of colonies, formed with the object of co-ordinating production and export.

THE EMPIRE COTTON GROWING REVIEW

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ABSTRACTS OF CURRENT LITERATURE

COTTON IN INDIA.

277. SECOND CONFERENCE ON COTTON GROWING PROBLEMS IN INDIA, JANUARY, 1941. (*Rpt. and Summ. of Proc.* Published by Ind. Cent. Cott. Comm., Bombay, 1941. Price Rs. 2-8-0, Foreign 4s.) The Conference was open to all members of the Indian Central Cotton Committee and cotton research workers in India, including those of the Agricultural Departments. Abstracts only of the longer papers and the full text of the shorter ones, with a report of the discussions, are recorded. Some of the papers presented have already been noted in this Review. Others are dealt with under their respective sections in the present number.

278. THE INDIAN CENTRAL COTTON COMMITTEE AND ITS WORK. By D. N. Mahta. (Ind. Cent. Cott. Comm., Bombay, 1942.) We have received a copy of this useful pamphlet discussing briefly the constitution and aims of the Committee and what it has accomplished during the twenty-one years it has functioned. During this period valuable work has been carried out in connection with the breeding and cultivation of better varieties of cotton, improvement of marketing conditions, publication of more accurate cotton forecasts and of statistics of importance to the grower and the trade, and the enactment of legislation for the improvement of cotton transport, ginning, and baling. Brief summaries are also included of the work of the Technological Laboratory, Bombay, the Institute of Plant Industry, Indore, and of the research work on cotton in Bengal, Bombay, Central Provinces, Madras, Mysore, Punjab, United Provinces, etc.

279. INDIAN CENTRAL COTTON COMMITTEE. (*Ann. Rpt. to August* 31, 1941.) Continued progress is recorded in the work of the Committee throughout the year. Thirty-four research schemes and 18 seed extension schemes financed by the Committee were in operation. At the Technological Laboratory, Matunga, 1,800 samples were tested, compared with 768 in the previous season, and 1,046 reports on these samples were issued. A number of technological investigations were also in progress in connection with the pre-cleaning and ginning of Indian seed cotton on different machines and with different settings and speeds, the effect of different treatments in the blow-room, effect of storage under Bombay conditions on the quality of Indian cottons, the influence of swollen hair diameter on the spinning quality of cotton, etc. Good progress was made in the important

work carried out at the Institute of Plant Industry, Indore, on cotton genetics, physiology, selection and breeding, varietal trials, and seed multiplication and extension. The various Acts passed for the regulation of transport, marketing, ginning and pressing of cotton and the prevention of the introduction of foreign pests, continued to function satisfactorily during the period under review. Progress was also made in the investigations in connection with the following pests and diseases: spotted bollworm, jassid, black-headed cricket, cotton stem weevil, pink bollworm, and root-rot and wilt diseases.

280. Indian Central Cotton Committee. The report of the forty-fourth meeting of the Committee held in Bombay on July 18 and 19, 1941, has recently been received, and contains summaries of the final or progress reports of the many research schemes financed by the Committee. These include schemes in connection with cotton breeding, seed distribution and extension, marketing, ginning and pressing, control of pests and diseases, and recommendations for new research. The valuable work carried out during the 1940-41 season at the Technological Research Laboratory, Bombay, was also reviewed.

281. Indian Cotton: Statistics. We have received from the Indian Central Cotton Committee copies of Statistical Leaflets Nos. 2, 3, and 4, 1940-41, giving information regarding the following: Stocks of Indian raw cotton held in India by the mills and the trade on August 31, 1941; receipts at mills in India of raw cotton classified by varieties, 1940-41 season; exports by sea of Indian raw cotton classified by varieties, 1940-41 season.

282. The Need for more Intensive Programmes in Hybridization of Cottons in India. By V. Ramanatha Ayyar. (Coimbatore.) (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, p. 18.) Selection had not, in India, produced sufficiently encouraging improvements in the past, due either to faulty technique or the absence of variability. This paper emphasizes the need for undertaking hybridization in addition to selection. Past failures are analysed and desirable methods indicated. In practice these appear to involve an immense amount of work, but the prospect should be resolutely faced.

283. The Effect of Storage, under certain Specified Conditions, on the Quality of Indian Cottons. By N. Ahmad and A. N. Gulati. (Tech. Lab., Bombay.) (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, p. 137.) Storage for 2½ years in the bale produced distinct signs of deterioration in quality. Watering cotton always results in loss of strength and shade. Loss of strength increases rapidly with the humidity of the atmosphere in which the cotton is stored. The evil effects of adding water before pressing are clearly shown. These can be avoided by a small addition of formalin, but the authors strongly deprecate watering in any form.

284. Spinning Test Reports on Indian Cottons, 1940-42. By N. Ahmad. (*Tech. Circs.*, Nos. 465-74, 477-8, 482-4, 486-8, 490-2, 494, 499-502. Ind. Cent. Cott. Comm.) The circulars contain the report of the Standards Committee and spinning test results for Gaorani 6, Khandesh, LSS, Broach, Jayawant, Upland, Navsari, Farm Westerns, Kadi-Viramgam, Bijapur, Berar, C.P. No. 1, and Punjab-American 4F cottons; the grader's report and spinning test results for Farm Westerns, Miraj, Hubli Kumpta, Hubli Upland, Westerns, Broach, Bailhongal, Cambodia, Karunganni, and Jagadia cottons; the report of the Special Appeal Committee for African cottons and spinning test results for A.R. Kampala, A.R. Busoga, and A.R. Jinja cottons.

285. A Review of the Position Regarding Relation of Fibre Properties to Spinning Performance of Indian Cottons. By N. Ahmad. (Bombay.)

(*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, p. 141.) Investigation has revealed the fibre properties which exercise the greatest influence in determining spinning quality.* There is, however, a certain percentage of " abnormal " cottons whose actual performance is much above or below the value predicted from their fibre qualities. Their study has indicated the desirability of dividing Indian cottons into four groups, each with certain characteristic fibre properties in common. This enables closer agreement to be reached.

286. SPINNING QUALITY OF KHANDESH COTTON STRAINS WHEN GROWN IN DIFFERENT TYPES OF SOIL. By T. R. Khadilkar. (Jalgoan.) ENVIRONMENT AND QUALITY OF COTTON. By K. Ramiah and V. G. Panse. (Indore.) VARIATIONS IN THE MEASURABLE CHARACTERS OF COTTON FIBRES. IV. VARIATIONS CAUSED BY CHANGE OF PLACE AND SEASON. By R. L. N. Iyengar. (Coimbatore.) EFFECT OF CLIMATIC CONDITIONS, RAINFALL, SOIL AND LOCALITY ON THE FIBRE PROPERTIES, GINNING PERCENTAGES AND YIELDS OF JAYAWANT COTTON. By H. R. Nayak. (Dharwar.) (*Rpt. and Summ of Proc. Ind. Cott. Conf.*, 1941, pp. 143 *et seq.*) These four papers give accounts of investigations in their respective areas into the relations between climatic and soil differences and the ensuing variations in the crop, especially in the quality of the cotton. Fibre length, lint weight, and ginning percentage are notably affected.

287. TECHNOLOGICAL REPORTS ON INDIAN COTTONS, 1940-42. By N. Ahmad. (*Techn. Circs.*, Nos. 475-6, 479-81, 485-9, 493, 495-8. Ind. Cent. Cott. Comm.) The particulars given include agricultural details, grader's report, fibre particulars, spinning test results, remarks and conclusions.

Verum 262 (*Nagpur*).—Samples showed considerable falling-off in 1940-41. Yarns generally slightly neppy. Suitable for 24's warp.

Late Verum (*Nagpur*).—This cotton gave its lowest performance in 1940-41. Yarns somewhat neppy. Suitable for 24's warp.

289*F*/*K*25.—Yarns slightly neppy. Suitable for 28's warp.

*Cambodia Co.*2 (*Cambodia* 440).—Yarns slightly neppy, but show distinct improvement since 1934-35. Suitable for 28's warp.

Gaorani 6.—In 1940-41 yarns practically free of neps. Suitable for 32's warp.

Jayawant (*Kumpta*).—Yarns distinctly less neppy during the past five seasons. Suitable for 41's warp.

Sind Sudhar (289*F*-1).—Yarns somewhat neppy. Suitable for 46's warp.

Punjab-American 4*F*.—Yarns distinctly neppy. Suitable for 24's warp.

Jarila.—Yarns less neppy. Suitable for 24's warp in 1941-42, compared with 34's in 1940-41, indicating an appreciable decline in spinning performance.

Umri Bani.—Cotton would gain by being picked in a cleaner condition. Yarns less neppy. Suitable for 31's warp.

Late Verum (*Nagpur*).—Yarns less neppy in 1941-42. Suitable for 28's warp.

V. 434 (*Akola*).—Yarns practically free of neps. Suitable for 26's warp.

288. TECHNOLOGICAL REPORTS ON STANDARD INDIAN COTTONS, 1941. By N. Ahmad. (*Tech. Bull. Ser. A, No.* 54, 1941. Ind. Cent. Cott. Comm.) As in former years, the agricultural details, grader's report, fibre particulars, spinning tests and remarks are given for each of the twenty-two varieties tested. Only one cotton showed a definite improvement over last year, ten gave practically the same performance, while others showed a falling-off. Improvement was most marked in the Bombay cotton Jarila, and less so in Jayawant, 1027 ALF, Wagad 8, P.A. 289F, P.A. 4F, Koilpatti 1, Karunganni C.7, Nandyal 14, N.R., and Umri Bani. The falling-off was most marked in Mollisoni and Hagari 1.

289. TECHNOLOGICAL REPORTS ON TRADE VARIETIES OF INDIAN COTTONS, 1941. By N. Ahmad. (*Tech. Bull. Ser. A, No.* 53, 1941. Ind. Cent. Cott. Comm.)

The valuation reports of the Standards Committee and of the Special Appeal Committee and spinning test results for the 1940-41 season are given for 21 varieties of cotton supplied by the East India Cotton Association, and the mill valuation reports and spinning test results for seven cottons supplied by the Bombay Millowners' Association, and two by the Southern India Millowners' Association.

290. THE HANDLOOM INDUSTRY. (*Cotton*, M/c, 11/4/42, p. 5.) The sharp rise in yarn prices is causing considerable distress to handloom weavers in India, who are said to have been unable to raise the prices of their products to a proportionate extent. The position has been made more acute by a serious shortage of mill yarn in certain weaving centres. Government hope that mills will put forth their maximum effort to expand the output of cotton yarn. As a further measure to increase the supply of yarn in the domestic market Government have decided to restrict forthwith exports of yarn to their pre-war normal. They are also considering the suggestion of instituting an all-India control over the distribution of yarn for a satisfactory solution of the problem of yarn supply to handloom weavers and to meet war requirements. A recent meeting of the Textile Advisory Council held at New Delhi considered, among other things, ways and means of making yarn available to handloom weavers at reasonable prices.

291. JARILA COTTON. (*Cotton*, M/c, 1/8/42, p. 6.) The improved strain Banilla was first evolved for the Khandesh tract under a breeding scheme financed by the Indian Central Cotton Committee, but as its spinning qualities showed deterioration further breeding work was continued and resulted in the production of the wilt-resistant Jarila cotton, which has a medium staple and a spinning capacity up to 24's counts, against 10's to 12's of the local mixture. The area under Jarila in the Khandesh tract in 1940-41 was estimated at 200,000 acres, and the strain is also spreading rapidly in certain areas in Berar. The combined effect of the introduction of the improved varieties Verum, Buri, and Jarila has resulted in the last two or three seasons in a rapid rise in the proportion of medium staple cottons in the Central Provinces and Berar; they now occupy some 30-33 per cent. of the total cotton area in the Province.

292. INDIAN TEXTILES: DESIGN. By A. Leix. (*Ciba Rev.*, **36**, 1942, p. 1301. From *Summ. Curr. Lit.*, xxii, 14, 1942, p. 322.) An illustrated account is given of native Indian textiles of the nineteenth and twentieth centuries, their manufacture and their patterns.

293. REPORT OF THE IMPERIAL COUNCIL OF AGRICULTURAL RESEARCH, 1940-41. (Pubd. by Manager of Publications, Delhi, 1942. Price Rs. 2-12 or 4s. 6d.) An account of the work of the year in connection with agricultural research on various crops, animal husbandry, soil problems, pest control, sugar industry, etc. Cotton is not included.

294. AGRICULTURE AND ANIMAL HUSBANDRY IN INDIA, 1938-39. (Pubd. by Manager of Pubns., Delhi, 1941. Price Rs. 6 or 9s. 6d.) This report, which has recently been received, deals with agricultural conditions in India during 1938-39; economic work on crops; developments in tobacco production and marketing; composts and composting; research in crop production; agricultural marketing and engineering; animal industry; veterinary research; agricultural education; the co-operative movement as affecting agriculture, etc. The research schemes financed by the Indian Central Cotton Committee, and the work of the Technological Laboratory, Bombay, and of the Institute of Plant Industry, Indore, are reviewed.

295. GEOGRAPHICAL RACES OF *G. arboreum*. By V. N. Paranjpe. (Bengal.) (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, p. 70.) Types of cotton belonging

to *G. arboreum* var. *cernuum* and *G. arboreum* var. *neglectum* forma *bengalensis* are met with in hill tracts of Assam and Bengal. The extreme isolation of races and places has restricted the various types to small areas in different sections of hills. Manipur State, alone, produces a type which probably belongs to the *Indicum* group, a very early, broad-lobed, yellow-flowered plant with smooth long lint.

296. Bombay Cotton Annual, 1940-41. No. 22. (East India Cotton Assen. Ltd., Bombay. Price Rs. 1-8-0.) This is the usual authoritative compendium of all matters relating to every branch of the cotton trade. The first section contains the Twentieth Annual Report of the Directors of the East India Cotton Association for the season 1940-41. This is followed by numerous statistical tables of acreage, production, exports, imports, prices, stocks, consumption, Government notifications, etc. An account is also included of the progress made in the introduction of improved varieties of cotton. The publication should prove invaluable to all those who are interested in the production, distribution and consumption of Indian and foreign cottons, yarn and cloth.

297. Bombay. Textile Labour. (*Text. Manufr.*, lxviii., 809, 1942, p. 196.) The final report of the Bombay Textile Labour Enquiry Committee, issued in 1941, makes the following among other recommendations for the improvement of the Indian cotton mill industry: An increase in wages in order to maintain a minimum standard of living; improvement in working hours and the prohibition of night work in certain sections of the industry; rationalization to increase the productive capacity of the industry and raise the standard of living of the workers; previous to rationalization measures to be taken to ensure the use of better quality cotton and good mixing, the maintenance of machinery in good working order, and the provision of adequate lighting and ventilation; improvement of the organization of export markets; the establishment of a national tripartite industrial council for technological and economic research; the regulation of output and prices. Welfare recommendations include the establishment of an institute for research on industrial hygiene and industrial psychology; provision of canteens, dining rooms, rest places, etc.; facilities for recreation; appointment of women welfare officers where large numbers of women are employed; distribution of free milk in crèches in the mills supervised by doctors appointed by the mills; installation of air-conditioning plants and apparatus for dust removal from card rooms; establishment of dispensaries in mills under qualified doctors; and regular inspection of factories. The need is stressed for better housing conditions for workers, and the Committee favours legislation for the regulation of money-lending. Other recommendations made include the introduction of a system of gratuities after about 15 years' qualifying service, and the establishment, where possible, of provident funds open to all classes of employees; compulsory contributory sickness and unemployment insurance schemes; establishment of employment exchanges in large industrial centres; the extension of training facilities, and the setting up of labour courts for dealing with cases of dismissal.

298. Bombay: 8-1 Cotton for Surat. By B. S. Patel. (*Ind. Frmg.*, March, 1942, p. 151.) The Agricultural Department has evolved a strain called Seg. 8-1, by crossing 1027 ALF and Selection 1-A cottons, which combines the good qualities of both parents and is wilt-resistant. With a view to replacing both 1027 ALF and Selection 1-A (which are susceptible to wilt) as soon as possible, all the available seed of Seg. 8-1 has been grown on about 60 acres this year, and if results are successful the seed will be planted on 1,000 acres next year. It is hoped to cover the whole Surat tract with this strain within four or five years.

299. A Review of Cotton Breeding Work in Gujarat. By G. P. Patel. (Surat.) (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, p. 48.) Apart from two areas which grow varieties of *G. arboreum*, Gujarat is all under *G. herbaceum* var. *frutescens*, Delile, the principal varieties being Surtee-Broach, Goghari and Wagad. The steps taken to isolate and improve types of superior merit are reviewed. Recent importations have been made of *herbaceums* from Russia and Iran to form additional sources of variability.

300. Central India: Growing of Mixtures. By K. Ramiah and V. G. Panse. (Indore.) (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, p. 92.) In Central India the components of the mixed Malvi cotton—namely, Upland and *desi*—remain in stable equilibrium, although Upland grown alone gives a very poor performance. Experiments in which the components were grown separately and mixed in different proportions have given results which show that mixtures suffer less from diseases than pure strains, give equally good or better yields, and show an improved spinning quality.

301. Hyderabad: Effect of Growing Mixtures of Pure Strains of Cotton on Crop Yields. By K. Sawnhey and D. V. Narayanayya. (Parbhani.) (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, p. 93.) The commercial crop of Umri Bani grown in Hyderabad State is a mixture of two species in the proportion 4 to 1, and the components themselves are made up of very mixed types. Nevertheless Umri Bani has given a fairly uniform spinning performance over several years. It appears that the crop in the field forms a more or less balanced population. This suggested the study of the behaviour of mixtures of pure breeding strains. The results of four years' investigation, carried out on randomized replicated plots, are discussed. Generally speaking, it was found that the percentage of crop matured, the ginning outturn and the fibre properties were intermediate between those of the pure strains and more or less proportionate to the percentage of occurrence of the pure strains in the plant population. The sole justification for adopting the practice of growing mixtures in preference to pure strains is their ability to give uniformly good yields year after year. The strains composing the mixture should be either closely allied strains of a variety, or, in the alternative, belong to different species which do not cross freely. Seed renewal will not necessarily be required any oftener than in the case of pure strains. Seed for planting must be taken from the entire produce and not from one picking.

302. Indore: Relation between Quality and Return per Acre in Cotton. V. G. Panse. (Indore.) (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, p. 84.) Return per acre is an integration of two components: the premium obtainable for quality and the yield of lint per acre. Opportunity was taken to study the question in Malwa by comparing the local Malvi cotton, the improved strain Malvi 9, and Cambodia, a superior Upland type introduced over twenty years back. Over an 8-year period the price of Cambodia was 10·46 per cent. higher than local and 5·94 per cent. higher than Malvi 9. This premium corresponds to a 125 and 50 per cent. improvement in spinning quality respectively. It was found that cultivation of Cambodia would not be profitable if its yield fell 10 per cent. below that of the local *desi* cotton or 6 per cent. below that of the improved strain. Analysis of yield figures shows that the yield of Cambodia is so much below this limit that its cultivation would be distinctly less profitable than that of the two *desi* varieties.

303. Madras: Cotton Cultivation, 1939-40. (Ann. Rpts. of various Stations, 1939-40, received 1942.) At Coimbatore the continuous rainfall during the early stages and the prolonged drought during the growing and maturing periods

affected the cotton crop adversely, and the actual yields proved disappointing. The work on cotton was mainly concerned with the improvement in quality and yield of the Coimbatore and Salems varieties. At the Hagari Station yields of H.1, though above normal, were lower than last season owing to damage caused by field rats. Crossing of this cotton with other strains is being carried out with a view to improving the yield, staple length, and ginning percentage. Growth of cotton at Koilpatti Station was poor owing to adverse weather conditions, and yields were below normal. In yield trials K.1 maintained its superiority over 18 other strains (12 from the Cotton Specialist, Coimbatore, 5 from the purity tests, and 1 from the Physiological Botanist). In comparative yield trials at Nandyal Station the strain 3002 gave 547 lb. kapas per acre compared with 417 lb. per acre for the control N.14. In district trials to study the performance of strains in tracts outside the Station, Local and N.23 cottons gave higher yields than N.14.

304. Mixed Cropping in India. By G. N. R. Ayyangar. (*Ind. Frmg.*, May, 1942, p. 255.) Experiments were conducted at the Agricultural Stations (Madras) in the cotton-growing areas to determine what crops could be grown as mixtures with cotton. At the Guntur Station a mixed crop of cotton and groundnuts proved more successful than cotton with either Italian millet or rice, and cotton alone. At Nandyal Station cotton and horsegram (*Dolichos biflorus*) gave yields similar to cotton alone, and the residual effect of horsegram in the mixed crop was non-existent or negligible. The only advantage was the produce from the horsegram grown in the mixed crop. At Hagari Station the yield of the pure cotton crop was higher than that of a mixed crop of cotton and Italian millet. At Koilpatti Station Bengal gram (*Cicer arietinum*), horsegram and coriander were grown mixed with cotton and compared with cotton grown alone. Results indicated that a low proportion of coriander does not affect the cotton yields and is a sound combination, since the produce of coriander from such a mixed crop is an extra gain. At the Central Farm, Coimbatore, it was found that mixed crops with cotton were not financially profitable. Experiments at Gokak Farm, in the Bombay Presidency, indicated that a mixed crop of cotton and *rala* (*Setaria italica*) yielded better than cotton alone, an experience contrary to that at Hagari. At Dharwar Farm cotton and groundnuts in alternate rows gave better results than cotton and groundnuts in blocks. The succeeding crop of sorghum also gave higher yields in plots of cotton and groundnuts in alternate rows than in cotton and groundnuts in blocks.

305. Mysore: Cotton Marketing. By M. Vasudevamurthy. (*Ind. Frmg.*, January, 1942, p. 43.) The effort made by the Department of Agriculture to encourage cotton cultivation in the Maddur and Malavalli areas resulted in the planting of some 3,000 acres. The following agreement is suggested to help in the marketing of the crop. The cultivator agrees to grow the cotton according to Departmental suggestions, pick the cotton clean, and deliver it to a central depot in quantities of not less than 10 maunds at a time. The depot advances seed, implements, oilcake, and gunnies in which to bring the kapas to the depot. After delivery of the cotton an arrangement will be made if necessary to advance to the cultivator part of its value. When sales have been effected by the Department the balance will be paid to him, less the advance. To deal with the cotton so grown and accumulated in the district, Government has sanctioned the construction of a ginning and pressing factory near Maddur at an estimated cost of a lakh of rupees.

306. Mysore: Cotton in Red Soils. By M. Vasudevamurthy. (*Ind. Frmg.*, April, 1942, p. 220.) The Botanical Section of the Agricultural Department is testing varieties of cotton for the red soils in both irrigated and dry tracts. Two

strains that are now grown on a large scale are MA.11 and Co.4. MA.11, evolved by the Mysore Department of Agriculture, grows well on all soils. It is a medium staple cotton with $\frac{3}{4}$-inch staple, ginning outturn of 30 per cent., and spins up to 30's. It yields 800-900 lb. per acre under irrigation, and even on dry land yields up to 700 lb. have been recorded. It is reported that this variety is rapidly replacing Doddahatti varieties usually grown in the Banavar area of Hassan district. Co.4, one of the important cottons evolved by the Department of Agriculture, Madras, has been found to grow well under irrigation, yielding about 1000-1200 lb. per acre. A staple of $1\frac{1}{8}$ inches, 34·5 ginning percentage, and capacity to spin up to 40's, has been reported. This variety has played an important part in the extension of cotton cultivation in the Irwin Canal tract.

307. Improvement Effected by Hybridizing American (Indian) Cottons with a Tree Cotton, *G. Peruvianum*. By G. Sreenivasa Ayyangar. (Mysore.) (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, p. 47.) Red leaf blight causes serious reductions in the yield of American cottons in Mysore. The cross between Dharwar-American and a tree cotton has produced two fixed types of great promise, one of which, MA.11, has proved more resistant to red leaf blight than any other variety.

308. Punjab: A New Commercial Cotton. By M. Amanat Khan. (*Ind. Frmg.*, May, 1942, p. 287.) The variety 124F, bred at the Multan station, has shown promise in the south-western tract and in the Lower Bari Doab Canal colony. The yield was higher than for 289F/43 and 289F/K25. Lint length is nearly 1 inch, and in spinning tests carried out at the Technological Laboratory, Bombay, it spun 43 counts compared with 40 from other similar types. Ginning outturn is 33·3 per cent. and nearly equals that of 289F/K25. It is early maturing, but is inferior to 289F/43 in jassid resistance, and will succeed only in tracts of the Punjab where jassids are not a serious menace to the cotton crop.

309. Investigations on the Partial Failures of Punjab-American Cottons in the Punjab. By R. H. Dastur. (Lyallpur.) (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, p. 122.) The failures to which the title refers recur frequently and a special scheme of research was instituted to investigate their cause and remedy. Comparison with local cottons revealed a highly significant correlation in yield. The symptoms exhibited by the American cottons indicated starvation of some important nutrient. It was discovered that two soil types were associated with somewhat similar symptoms—namely, (1) soils with nitrogen deficiency and (2) soils with high salinity in the subsoil. The deficiency of nitrogen in the leaves can be readily recognized before they turn yellow by a simple tannin test, and if such fields are manured with sulphate of ammonia the trouble is remedied. No such direct remedy can be applied to the second class of soils. One measure which has achieved marked success in lessening the damage is the reduction of the size of the plant by delayed sowing, compensated by an increase in the number of plants to the acre.

310. Estate Farming in India. III. B.C.G.A. Farm, Khanewal. By Sir Wm. Roberts. (*Ind. Frmg.*, April, 1942, p. 174.) *Origin of N.T. Cotton.* The farm has been used extensively to test on a large scale new varieties of wheat and cotton. In the case of cotton the farm had a major share in introducing 289F, of which a few ounces only were brought by the writer from Mr. Milne's selections at Lyallpur in 1921. All subsequent long-staple types in the Punjab and Sind of the N.T. class are derived from this original seed. The most successful of all is a type selected at Khanewal Farm by Mr. Roger Thomas 8 years ago, and now grown over two lakhs of acres in Bahawalpur and Sind. The total production of 289F types to-day is not less than $4\frac{1}{2}$ lakhs of bales and the area

under the strain is probably 1,000,000 acres in the Punjab, Bahawalpur and Sind. With Khanewal as a centre, and applying the principles worked out there, the B.C.G.A. has taken large areas on lease in the Punjab, Bahawalpur, Sind, and Baluchistan, and now controls over 200,000 acres of irrigated land, and operates besides 13 ginning and pressing factories and 2 large oil mills. Seed for the Agricultural Department in the Punjab and Bahawalpur and for cultivators in Sind is supplied for well over 2½ lakhs of acres of cotton. The average yield of cotton on the farm for the last two years has been 12½ maunds (1,028 lb.) per acre. The highest average yield of cotton has been 15½ maunds (1,275 lb.) per acre.

311. Sind: Karachi Cotton Annual, 1940-41, No. 8. (Pubd. by Karachi Cotton Asson., Ltd. Price Rs. 2-8-0.) A useful compendium of all matters relating to the Karachi cotton trade, with particular reference to Sind, the Punjab, United Provinces, and Rajputana. Many statistical tables and charts are included of cotton crops, exports, prices, stocks, consumption, etc.

312. United Provinces, Cotton Industry, 1940-41. (*Karachi Cott. Ann.*, 1940-41, p. 89.) The results of extensive trials of C.402, C.520 and Perso-American under cultivators' conditions all over the United Provinces confirmed for the fourth year in succession the unsuitability of C.402 and the superiority of Perso-American and C.520. Perso-American—a selection from the American types of cotton imported from Iran and acclimatized in the United Provinces—gave an average yield of over 13 maunds per acre at the Government farm Raya. With a ginning outturn of 32 per cent., a staple length of 0·88 inch, it can spin up to 31 counts. During the year under review it covered 3,793 acres, compared with 2,534 acres in the previous year. The demand for seed is such that it is estimated that the acreage in the 1941-42 season will double that of 1940-41. It was sold at a premium of Rs. 2 per maund of kapas over the local unimproved types.

313. American Varieties of Cotton and their Cultivation in the United Provinces. By B. L. Sethi and G. K. Sant. (United Provinces.) (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, p. 50.) The paper deals with the behaviour of certain American varieties of cotton in the United Provinces, the possibilities of extracting better types from the available material, and the various agronomic factors essential for successful cultivation of American cottons. Trials at six centres in the last three years have established, in general, the superiority of Perso-American over others in yield. The strain referred to was one selected from material introduced to the United Provinces by Dr. Leake several years ago.

COTTON IN THE EMPIRE (EXCLUDING INDIA).

314. The British Cotton Growing Association. The thirty-seventh Annual Report to December 31, 1941, gives an encouraging account of the work of the B.C.G.A. (Punjab), Ltd., and of progress in cotton cultivation in the majority of the Empire countries. The spread of hostilities has presented many and varied problems to the Empire cotton-growing countries—loss of markets, the necessity of growing more food, difficulties of obtaining supplies, and the outstanding problem of shipping space—but most of them have produced very useful crops. In Africa especially, war-time restrictions interfered with the supply to ginning factories of adequate quantities of renewal spares, baling materials, etc., but on the whole the factories were able to operate satisfactorily, and in Nigeria a record crop was handled. The total world production of commercial cotton for the 1940-41 season is given as 28,683,000 bales. Exports by the United States were cut down

to the lowest level since the American Civil War, whereas domestic consumption was on a far higher level than any previously recorded. There was also an increase in consumption in India and Canada.

315. ASIA. CYPRUS: COTTON VARIETY TRIALS, 1940. (*Ann. Rpt. Dir. Agr.*, 1940, received 1942.) Sixteen cotton variety trials carried out in various districts confirmed the previous year's results that Coker 100 is definitely superior to any other cotton grown in the island. Plans have been made to multiply this variety under close supervision to prevent deterioration. A number of selections of cotton have been made in peasants' fields.

316. AFRICA. KENYA COLONY: COTTON INDUSTRY, 1940-41. (*Ann. Rpt. Br. Cott. Grwg. Asscn.*, 1941.) There was a revival of interest in cotton in the 1940-41 season, the total yield being approximately 15,000 bales of 400 lb. In the Nyanza Province, the main producing area, the season in the northern parts was very favourable, but in the more southerly areas the yield was reduced by drought. Conditions were favourable in the Coast Province and boll disease was comparatively slight.

317. NIGERIA: COTTON INDUSTRY, 1941-42. (*Half-yrly. Rpt. to March* 31, 1942.) *Northern Provinces.* Rainfall and general weather conditions were good from planting time to the middle of September, but at the latter part of the growing season the early cessation of the rains and a corresponding early onset of the Harmattan had a very adverse effect on cotton yields; circumstances arising out of changing war conditions also contributed to low production. Sixty-six gazetted markets were opened for the purchase of seed cotton, compared with 94 in the previous season. This was the second season in which the Produce Inspection Division was responsible for inspection in the main cotton belt; there was a still more rigid enforcement of the Cotton Marketing Regulations and a noticeable improvement in grading and general marketing methods. For the first time a Produce Examiner was posted at each ginnery to check the quality of the cotton coming in and the condition of bags, including sealing and sewing. On the whole grading of the cotton reaching the ginneries was satisfactory, and there was an improvement in the condition of the bags used for transport of the cotton to the ginneries, due to the growing tendency towards a "Standard Pack" of 100 lb. net. The proportion of Grade II cotton was 8·5 per cent. only of total purchases, as compared with 47 per cent. in 1940-41. Provisional reservations of seed for the 1942-43 season amount to just over 6,000 tons, sufficient under favourable conditions for a crop of about 60,000 bales.

Southern Provinces.—Only 13 cotton markets were gazetted this season. Growth of the cotton has been very good, and a really excellent crop is expected which may double that of last season.

318. NYASALAND: COTTON PROSPECTS, 1941-42. (*Nyasaland Agr. Qrtrly. Jour.*, January, 1942, p. 1.) In all areas where the seed distribution of cotton has commenced the demand has been keen, and there are indications that issues will exceed those of 1940-41. Growers were generally satisfied with the prices received for their last crop, and it is anticipated that this will be reflected in an increased acreage during the coming year. The marketing of the North Nyasa crop continues, and 172 tons of seed cotton had been sold by the end of December.

319. NORTHERN RHODESIA: COTTON INDUSTRY, 1940-41. (*Ann. Rpt. Dpt. of Agr. N. Rhod.*, 1941.) The disastrous preceding season and the demand for labour affected cotton production in the Marambo (Luangwa Valley) area. The number of growers fell from 700 to 525 but the total output was slightly increased. 95,600 lb. seed cotton were purchased, the average return per grower being 10s. 2d.

320. SOUTHERN RHODESIA: CONSERVING SOIL IN THE NATIVE RESERVES. By D. Aylen. (*Rhod. Agr. J.*, May-June, 1942, p. 152.) After describing conditions in the Reserves, the author discusses the scope of the work that is being carried out under the following headings:—*Centralization:* The Reserve is surveyed and divided into grazing and arable lands, selecting for each purpose the land best suited to that purpose and utilizing as far as possible the natural features of the country (*i.e.*, hills and rivers) to demarcate the divisions. Village sites are also selected. *Planning and Layout* of the soil conservation works. The roads are also altered to conform with soil conservation principles if this work can be done at a small cost. *Construction* of the soil-conservation works. *Allocation* of plots within the soil conservation works to individual natives, and the gradual removal of huts to the new village site. *Demonstration* of better methods of agriculture, and in certain cases the planting of trees is demonstrated. *Improved water supplies. Maintenance* and supervision of the above items. *Gully control.* In the near future it is intended to engage and train several small gangs for gully control work in the Reserves. The need for better roads for internal traffic is discussed.

This year it is intended to complete the protection of a large block of land in one fairly well populated Reserve, where during the last few years 7,000 acres have already been contour-ridged, by undertaking the work on the remaining 23,000 acres of arable land within this block. The works will be set out for the natives, and under the powers conferred by the Natural Resources Act they will be ordered to construct them. They will be lent 100 "Evans-type" land levellers fashioned from old railway steel sleepers, and a supply of discarded shovels. To encourage adequate construction and ensure completion of the works a small bonus (based on yardage) will be paid to the natives of each village when the works are satisfactorily completed. If the scheme is a success the rest of the arable lands, a further 20,000 acres, will be protected next year. The paper is well furnished with good illustrations.

321. COMPOST MAKING. (*Rhod. Agr. J.*, March-April, 1942, p. 46.) It is satisfactory to note a large increase in the total quantity of compost made during 1941 compared with the previous year, but under the present conditions of increasing fertilizer prices, and a possible shortage in supplies, farmers are urged to make every ton of compost they can in order to maintain and increase the production from their soils. The use of compost will, in most cases, make it unnecessary to apply nitrogenous or potash fertilizers to their crops, and will greatly economize phosphatic fertilizers since reduced quantities may be employed. At the same time the humus in the compost will help to maintain the all-important crumb structure of the soil on which the tilth depends. During the year 674 farmers manufactured 236,727 cu. yds. of compost (approximately 118,363 tons), compared with 148,959 cu. yds. (approximately 74,480 tons) in 1940. It is hoped that every farmer will consider it a national duty to make the greatest effort to increase his production of this most valuable source of soil fertility.

322. EROSION AND MALARIA. By G. R. Ross and D. Aylen. (*Rhod. Agr. J.* April, 1941, p. 173.) Discusses the relationship between erosion, the disease of the soil, and malaria, the disease of the body, and the measures recommended for the control of both evils.

GULLY CONTROL. By D. Aylen. (*Rhod. Agr. J.*, March-April, 1942, p. 73.) A continuation of the previous paper, describing various new features or methods of gully control, and points which make for success or disaster, which have come to light as the result of recent experiments. Both papers are well furnished with illustrations.

323. SOUTH AFRICA: COTTON INDUSTRY, 1940-41. (*Rev. of* 1940-41 *Cott. Crop*, received 1942.) General climatic conditions during the growing season were

fairly good, and a satisfactory crop was produced. In contrast with previous years, when most of the cotton was exported, the entire crop was taken by South African industries. The demand was much larger than the supply; prospects for cotton growers, therefore, seem good.

324. COTTON PROSPECTS, 1941-42. (*Ann. Rpt. Emp. Cott. Grwg. Corpn.*, 1940-41.) Planting rains were early, but sketchy in some districts. While other crops were said, in February, to be suffering from drought, cotton reports at that time were favourable. Guaranteed prices may lead to larger acreages of cotton being planted in the future.

325. SWAZILAND: WORK OF THE COTTON EXPERIMENT STATIONS, BREMERSDORP AND CROYDON, 1940-41. By J. V. Lochrie. (*Prog. Rpts. Exp. Stats.*, 1940-41. *Emp. Cott. Grwg. Corpn.*) The season was marked by rainfall below average, and at both Stations the season was short. Insect pests were not important, but at Bremersdorp bacterial bollrot caused considerable loss. Cotton strain tests were carried out in conjunction with the Barberton Station. A series of fertilizer experiments was conducted both on cotton and maize. At Bremersdorp all results indicated the primary necessity of phosphate for plant growth and yield, while potash and nitrate of soda gave excellent returns at Croydon. The application of compost gave good results. The effect of cotton on the subsequent growth of maize was good, but the complication introduced by witchweed infestation affected the final yields. The beneficial results of early weeding were demonstrated. Other crops, mainly legumes, were cultivated. Groundnuts and beans grown for grain did not do well, but others grown for forage or compost making were satisfactory; of these velvet beans proved the most successful.

326. SUDAN: WORK OF THE PLANT BREEDING STATIONS, 1940-41. (*Prog. Rpts. Exp. Stats.*, 1940-41. *Emp. Cott. Grwg. Corpn.*) The main points emerging from the season's work are as follows: The successful production in bulk of Sakel-type cottons carrying a considerable measure of resistance to blackarm (*B. malvacearum*) now seems more than probable in the near future. Substrains of the Sakel selection N.T.2 have continued to give good results, and their resistance to leafcurl disease has been further demonstrated. An American Upland variety which may prove more profitable than the existing type in the Nuba Mountains has reached an advanced stage in bulk propagation, while a further strain has shown great promise in replicated trials. Introductions from Uganda have shown promise in Equatoria, particularly as regards earliness of cropping, while locally-bred types also gave good yields. A recommencement of systematic work on the dura crop has been made. Dura is the staple crop of the country and occupies 1½ million acres annually. In the Gezira it takes a definite place in the rotation with cotton.

327. TANGANYIKA TERRITORY: CROP PROSPECTS, 1942. The crop report for February, received from the Department of Agriculture, states that a dry period in the Lake, Central, Eastern, and Southern Provinces has led to a deterioration in the crop position in many areas, and rain is urgently needed. In some areas, however, rain was experienced at the very end of February. It is not anticipated that there will be any difficulty in meeting local food shortages should they occur. Cotton prospects remain good, while a fair groundnut crop is anticipated.

328. COTTON PURCHASE. (*Crown Colonist*, August, 1942, p. 539.) H.M. Government has undertaken to purchase all non-native and third-quality cotton produced in Tanganyika, elsewhere than in the Lake Province, which remained either unsold or unshipped at the end of April, 1942, at a valuation not exceeding £10 per bale in the case of non-native cotton and £5 10s. per bale in the case of third-quality cotton. A strict condition of such purchase is the production of

evidence by the vendor that up to that date he has been either unable to sell the cotton or unable to ship it. Government has appointed the Tanganyika Cotton Co., Ltd., of Morogoro, to be Honorary Government Agent for the purchase of this cotton.

329. COMBATING SOIL EROSION IN THE CENTRAL PROVINCE OF TANGANYIKA TERRITORY. By R. R. Staples. (*E. Afr. Agr. Jour.*, vii. 3-4, 1942, pp. 156, 190.) Accelerated erosion in its most advanced forms menaces the welfare of the African peoples inhabiting the Central Province of Tanganyika Territory. This problem is bound to arise where some half a million natives, one and a quarter million cattle and a million sheep and goats are all engaged in an often desperate struggle for existence (largely due to the primitive methods of land use) in a semi-arid country. The need for soil conservation in the Province is so pressing that it has been decided that anti-erosion work shall form the basis of increased production work even in war-time. An account is given of the efforts being made to overcome the evil. Part I opens with a general description of the region: physiography, geology and soils, climate and rainfall, vegetation, population, stock and crops. This is followed by a brief account of various soil-conservation projects that have been started in the Mpwapwa, Dodoma, Manyoni, Kondoa, and Singida districts, and of the results achieved. Part II describes soil-conservation measures which investigation and experience over the past 10 years have shown to be most suitable for Central Province conditions; these include deferred grazing, ridge cultivation, contour banks, bush clearing, grass planting, manuring, hedging, and planting windbreaks. To enable more rapid progress to be made in the application of the soil-conservation measures considered suitable, the author suggests that under present conditions (*i.e.*, in the absence of a Soil Conservation Section for the Territory) the best plan would seem to be to appoint a standing provincial committee to control all soil-conservation projects in the Province. The members would naturally be the representatives of the departments concerned, and would have as their chairman the Provincial Commissioner. It might be a subcommittee of the proposed Provincial Welfare Committee, and could possibly deal with all matters connected with land use in the Province.

330. EAST AFRICAN AGRICULTURAL RESEARCH STATION, AMANI, TANGANYIKA TERRITORY. (*Ann. Rpt.*, 1941. Pubd. H.M. Stat. Off., 1942. Price 3d. net.) The work of the Station during the year was mainly devoted to war-time investigations, full reports of which were issued separately as each investigation was completed. Shortage of staff, particularly chemists, was a great handicap, but certain lines of agricultural research were continued on a reduced scale.

331. UGANDA: COTTON INDUSTRY, 1941-42. (*Crown Colonist*, May, 1942, p. 306.) The cotton season reopened in Buganda Province on March 12 and in the Eastern Province on March 16. The price to growers was Sh. 8·50 per 100 lb. of seed cotton for best quality at Kampala, proportionately reduced in outer districts. Arrivals were very heavy at first, but diminished after the purchase of the Eastern Province crop. The average grade was good and considerable quantities were purchased by Government.

332. COTTON PROSPECTS, 1942-43. In the report of the Department of Agriculture for June it is stated that, owing to abnormally wet weather and to the fact that increased acreage is being planted to food crops, the preparation of the new season's cotton crop is not so far advanced as usual. Active steps are being taken in all Provinces to ensure that cotton is planted as early as possible and that it is sown at the correct spacing of 3 ft. by 1 ft.

333. A NEW SYSTEM OF GRASS-FALLOW STRIP-CROPPING FOR THE MAINTENANCE OF SOIL FERTILITY. By A. J. Kerr. (*Emp. J. Exp. Agr.*, x., 39, pp. 125-132,

July, 1942.) This paper by a member of the staff of the Uganda Department of Agriculture describes a further advance in the efforts of that Department to accelerate the operation of the native system of shifting cultivation without reducing its merit as regards soil regeneration and conservation. The author emphasizes that the native system restores to used land the crumb structure which it has lost under cultivation and which is all-important for the absorption of water and the prevention of erosion. Previous work has established that under the conditions prevalent in Buganda the use of planted elephant grass in place of the natural ecological succession for the fallow period reduces the time required for satisfactory regeneration to three years or less.

The drawback to operating this method in its simplest form on native holdings, by throwing out half the land at one time, is that all the work involved in the change-over falls into the same year. The system now proposed is that the unit of land should be divided into six plots over which the work is rotated in a 6-year course. Where the land is sloping the plots should take the form of six strips running across the slope. These may be regarded as three pairs, one of which is in cultivation each year and one resting. In the second year, to get into the rotation, the strips in the first pair are changed round; in the third year those in the second pair, and in the fourth year those in the third pair. Each strip thus receives 3 years' cultivation followed by 3 years' resting, and in any one year after the rotation is established one of the three cultivated strips is in its first year of cultivation, one in its second year, and the other in its third year, while the same applies to the three resting strips. The strip system operates against erosion both by restoring the crumb structure and by the effectiveness of the resting strips in stopping wash.

The paper proceeds to discuss the application of the system to Buganda conditions and to consideration of its advantages and its one disadvantage, the latter consisting in the departure from native practice involved.

334. Soil Problems. (*Ann. Rpt. Emp. Cott. Grwg. Corpn.*, 1940-41.) The Department of Agriculture has drawn up a policy to deal with problems of soil conservation, and two areas have been selected, one in Buganda and the other in the Eastern Province, where an intensive programme is being carried out under the administrative and technical officers working as a team. It is hoped that these areas will serve later as demonstration units whereby the chiefs and their people will be stimulated to put into general practice those conservation methods which have proved successful. The Department also reports a general improvement in cultivation methods, particularly in regard to closer spacing, early planting, and the fact that cotton is now less frequently planted up and down hill on sloping land, but along the contours, thus checking soil erosion. Experiments are being directed towards raising the yield of cotton per acre rather than to increasing the acreage under cultivation; in the main cotton-growing areas expansion of acreage is held to be likely to lead to soil deterioration, and increased output should be sought through improved methods of cultivation.

335. AUSTRALASIA. Queensland: Cotton Industry, 1940-41. (*Ann. Rpt. Emp. Cott. Grwg. Corpn.*, 1940-41.) Plant breeders were employed on breeding cottons suited to the conditions in different areas, and in particular in the search for a variety resistant to the jassid pest. In this connection it is interesting to note that material derived from a hybrid in which one of the parents was U.4, which originated at the Corporation's Station in the Transvaal, is stated to contain some promising strains.

The advantages to be derived from growing cotton with supplementary irrigation facilities were demonstrated at the Research Station, an average yield of nearly 1,500 lb. of seed cotton per acre being obtained on the irrigation plots,

compared with 420 lb. on the rainfall plots. Problems which are absent when cotton is a rain-grown crop at once present themselves under irrigation conditions, and these are receiving attention in the experimental work. In Queensland, as a whole, weather conditions in 1940-41 were not conducive to high yields; nevertheless a considerable increase was obtained over the output of the previous year.

336. THE COTTON INDUSTRY IN AUSTRALIA. By J. D. Young. (*Prod. Rev.*, 15/11/41. From *Cott. Lit.*, March, 1942, p. 91.) A lecture given before the Blennerhassetts' Commercial Educational Society of Australasia. Australia consumes about 350,000 bales of raw cotton of 500 lb. each per annum; only 13,000 bales of this are grown in the country, all of which comes from Queensland. Reasons why Australia is not self-sufficient in raw cotton production are given.

337. WEST INDIES: THE WEST INDIAN SEA ISLAND COTTON ASSOCIATION (INCORPORATED). The Sixth Ordinary General Meeting of the Association was opened in St. Vincent on October 31 last by His Honour the Administrator, who in his address of welcome strongly advocated the use of Sea Island cotton since he had proved from personal experience the excellence of the garments made from it. The President of the Association, Mr. C. C. Skeete, in his address stated that in general the past season had been fairly successful. Yield per acre had been above the average, increased acreage had been planted in Antigua, Montserrat, and Nevis, and production had reached a new record. Referring to production, the President said that he thought they would agree that there was a limit to the area on which it was economically suitable and, for some reasons, wise to grow cotton, and in his view they were approaching the limit and reaching a stage beyond which—except possibly in the case of Barbados—it would be dangerous to undertake further expansion. The danger lay in two main directions. Firstly, in the majority of cases any further increase would be at the expense of the area under food crops, and food crop production was still below the level required in the present emergency. Secondly, the interests of soil conservation demanded the exercise of great caution in bringing further areas under cotton until more suitable—that is, more soil-conserving—methods of agriculture were practised.

War conditions had reduced to a minimum the activities of the Advisory Committee in England, since little raw Sea Island cotton was going into consumption for commercial use, and trade in Sea Island cotton goods was necessarily small. The Association had rendered a great service to the Sea Island cotton industry by its decision to continue the accumulation of a reserve fund. This was considered a very sound policy, and the hope was expressed that it would be continued without modification during the coming year. Mr. Skeete paid tribute to the great value of the cotton-breeding work carried out under the direction of the Cotton Adviser, Mr. J. B. Hutchinson. The spinning tests undertaken at Mr. Hutchinson's request by the Shirley Institute of the British Cotton Industry Research Association had yielded valuable information, and the Cotton Adviser was now in a better position to plan cotton-breeding policy for the islands. The problem of pest control was also discussed, and the need was stressed for continued watchfulness in all the islands on the measures taken to control cotton pests. Finally, the important subject of marketing was dealt with. The President stated that the normal commercial outlet for their cotton was temporarily closed, but a contract made with the Ministry of Supply ensured a market for Sea Island cotton at a very reasonable price for a specified period during which they would otherwise have found it very difficult to dispose of the crop.

The report also contains full statistical information relative to the cotton industry, and a note by Mr. J. B. Hutchinson on "The present position with regard to spinning tests of Sea Island cotton," in which appreciation is expressed of the help afforded by the Shirley Institute of the British Cotton Industry Research Association in carrying out spinning and hair tests on samples of Sea Island cotton, which has enabled much valuable information to be obtained on the variations in quality of the cotton in the different West Indian islands.

338. THE WEST INDIA COMMITTEE. REPORT OF THE EXECUTIVE COMMITTEE FOR 1941-42. (*W. Ind. Comm. Circ.*, June, 1942, p. 85.) Owing to war conditions the work of the Advisory Committee in England of the West Indian Sea Island Cotton Association, on which the West Indian Committee is represented by its secretary, has been restricted. The Association's certification trade mark has been maintained and 66 certificates have been renewed for the year 1942. At the beginning of the year under review the Home Government became the sole importer and distributor and only a very small quantity of raw Sea Island cotton has been available for general consumption.

The area devoted to the 1940-41 crop in the West Indies was 21,550 acres, and production amounted to 8,413 bales of 400 lb. each. Both figures were the highest in the history of the industry. Of the total production, 7,963 bales were clean lint, which was purchased by the Ministry of Supply at 25d. per lb. for St. Vincent "superfine" and 22½d. per lb. for the "Montserrat strain" grown in the Leeward Islands. The output of Marie Galante cotton during 1940-41 was 899 bales, against 701 bales in the preceding season.

339. THE IMPERIAL COLLEGE OF TROPICAL AGRICULTURE, TRINIDAD. The Principal's report for 1940-41 indicates that teaching and research were continued during the year without interruption notwithstanding difficulties due to the war in connection with transport, higher living costs, and competition for the services of subordinates and labourers by the United States' bases and the oilfields. Research was mainly concerned with cacao, sugar-cane, and bananas, and summaries are included of the work carried out by the Departments of Agriculture, Botany, Chemistry and Soil Science, Economics, Entomology, Mycology, and Sugar Technology. A notable event of the year was a two-day meeting at the College of Sugar Technologists from all the West Indian sugar-producing colonies, at which several interesting and important papers were read and discussed. The number of students in residence on December 31, 1941, was 72. Thirty-one scientific papers were published during the year, including those contributed to *Tropical Agriculture*. The following additions were made to the Library: parts of periodicals, 8,637; pamphlets, 1,456; books (purchased) 128; books (presented) 19.

340. BARBADOS: COTTON INDUSTRY, 1940-41. (*Ann. Rpt. Dpt. Sci. and Agr., Barbados*, 1940-41.) 453 acres were planted to cotton, compared with 120 acres in the previous year. Growth was good and yields of seed cotton were above the average, and totalled 179,155 lb. The ginning percentage, as recorded by the Barbados Co-operative Cotton Factory, was 25·66 per cent. For the second year in succession no pink bollworm was found, and it is hoped it is being effectively controlled by the measures adopted. The cotton leafworm, *Alabama argillacea*, made its appearance in December, but was kept in check by efficient dusting and spraying. The holds of 17 ships were fumigated with "Zyklon B" and 12,520 bags of imported cotton seed were disinfected by means of the Simon's Heater.

Progeny row selection work was continued during the year, and the seed from these plants will be grown to provide commercial planting material for the 1942-43 crop. The selfed seed of the "bulked" seed cotton from the 1939-40 progeny

rows, grown at Codrington Experiment Station this season, will be distributed for commercial planting for the 1941-42 crop.

341. Cotton Industry, 1941-42. (*W. Ind. Comm. Circ.*, May, 1942, p. 77.) Peasants' cotton has been seriously defoliated by the cotton worm (*Alabama argillacea*). In spite of persistent advice by the Peasants' Agricultural Instructors to spray or dust as a preventive against this pest, little dusting and no spraying was done, and as a result of severe defoliation many peasants' plots have been pulled up and the land planted in sugar-cane or food crops.

342. Montserrat: Cotton Industry, 1940. (*Ann. Rpt. Dpt. of Agr., Montserrat*, 1940, received 1942.) Planting began on March 11 and ended on May 26. Germination of the seed was good, and wherever conditions of moisture were favourable the crop quickly became established. Destruction by grasshoppers and crickets made extensive supplying necessary. There was a fairly severe infestation of aphids and also slight attacks of *Alabama argillacea.* Pink bollworm did little damage to the main crop, but bolls which developed late in the season were heavily infested. The proportion of stained lint to clean lint was below normal, the main causes of staining being green bug, pink bollworm and cotton stainers. Acreages of cotton under the three systems of tenure in 1940 were: Freehold or rented lands worked by peasants, 1,838; Share System, 1,564; Estate Cultivation, 1,194; making a total of 4,596, a record acreage under cotton in Montserrat. The number of peasants working freehold or rented land was 2,508. The crop produced 998,310 lb. lint, giving a yield of 217 lb. per acre, a figure above the average for the past few years. Throughout the cotton-picking season local buyers bought clean seed cotton at 5½d. per lb. The whole of the crop of clean lint was purchased by the Government at 1s. 11½d. per lb. f.o.b. and shipped to the Ministry of Supply.

343. Cotton Breeding Experiments, 1940. (*Ann. Rpt. Dpt. Agr., Montserrat*, 1940.) Germination failures in 1939 resulted in the loss of a large part of the pedigree breeding material and made necessary a considerable departure from the normal breeding procedure. The majority of the 1940 material, in consequence, came from single plant selections made in the first multiplication plot, and in the four selected second generation bulks carried on in 1939. On their behaviour in non-replicated rows, ten of the selections made in commercial fields in 1938 were also included to give, in all, forty progenies for the main replicated progeny row trial of 1940. After detailed analysis, single plant selections were made from nine of these to be parents of the 1941 progeny rows. Progenies of the two plants germinating in the main breeding trial of 1939 were grown non-replicated and selections made for inclusion in the 1941 breeding scheme.

In 1930 seed from a progeny representative of the breeding material of the day was sent to the St. Vincent Type Collection. Here it was maintained until 1936, when a plant was sent to the Cotton Research Station in Trinidad, where it has since been carried on by grafting. Seed from this plant was returned to Montserrat in 1939 under the name Ba-1-5, and from this material five progenies were grown in non-replicated rows in 1940 and selections made for trial in the main breeding experiment in 1941. A small plot trial was carried out to compare four selected bulks, the two types selected from commercial fields in 1938, and type Ba-1-5. Analysis showed that the modern strains were superior in yield of lint, lint per boll, lint index and ginning percentage, but were inferior to Ba-1-5 in lint length and seed weight. The field selections as a whole were inferior to the selected bulks, but no differences were observed between the two types of commercial field selections. Between the four bulks there were differences in many of the recorded characters, and the best two were selected for separate multiplication.

344. Cotton Variety and Manurial Trials. (*Ann. Rpt. Dpt. Agr., Montserrat,* 1940.) Four Sea Island strains—viz., St. Vincent Superfine (V 135), St. Vincent Ordinary (BD), Sea Island White Flower (SIW) and a V 135 × MSI hybrid—were tested against the standard Montserrat Sea Island strain (MSI). Only one variety, BD, compared at all favourably with the local strain. Its yield, expressed as seed cotton per acre, exceeded that of MSI by 173 lb., or 20 per cent., but due to the higher ginning outturn of the latter yields of lint were practically the same for both varieties.

A single level NPK factorial experiment in which the triple interaction N × P × K was confounded with blocks, was carried out at Whites Estate. Eight sub-blocks were employed and the plot size was $\frac{1}{40}$ acre. A plot manured with cottonseed meal was included in each sub-block for comparison with the artificials. The manures were applied 5 weeks after sowing at the following rates:

N. Sulphate of ammonia	2 cwt. per acre
P. Superphosphate	2 " " "
K. Sulphate of potash	1½ " " "
CSM. Cottonseed meal	6 " " "

Sulphate of ammonia, acting mainly through boll size, produced an average increase in yield of 160 lb. seed cotton per acre, and, in spite of a significant depression in ginning outturn, an increase of 46 lb. lint per acre, or about 10 per cent., was obtained. At the prevailing market prices of lint, fertilizer, etc., this represents a difference of about £2 12s. in the net return per acre. A difference of 38 lb. lint per acre was observed in favour of plots manured with superphosphate. This difference, which, however, fell just short of the level required for statistical significance, was mainly due to an increase in the number of bolls matured. There was no response to the application of either sulphate of potash or cottonseed meal, and heavier dressings of the latter appear to be indicated. No significant interaction between any two of the three artificial fertilizers was observed.

345. St. Vincent: Purchase of Seed Cotton. (*W. Ind. Comm. Circ.*, June, 1942, p. 97.) The advances to be paid by the Government Cotton Ginnery on Sea Island seed cotton of the 1941-42 crop, purchased on the coöperative system, have been fixed at 9c. per lb. for white and 1½c. per lb. for stained.

COTTON IN THE UNITED STATES.

346. Cotton Quality Statistics, United States, 1939-40. (*U.S. Dpt. Agr.*, Washington, D.C., 1940.) This is a continuation of a series of reports issued previously under the title of "Grade, Staple Length, and Tenderability of the Cotton in the United States." Information is given concerning the quality of cotton on hand in the United States as at August 1, 1939, and the quality of cotton ginned during the 1939-40 season. For the first time figures are included showing the grade and staple length of the supply (carry-over plus crop) and the disappearance of Upland cotton.

1940-41 Season.—Information is presented on the quality of cotton on hand in the United States at August 1, 1940, and the quality of cotton ginned during the 1940-41 season.

347. American Cotton Crop, 1942-43. Cotton Growers urged to plant their Full Allotment. (*Cotton*, M/c, 18/4/42, p. 6.) The U.S. Secretary of Agriculture called upon United States cotton farmers to plant their full AAA allotment of about 27,400,000 acres of cotton in 1942, and recommended that as much as possible of this allotment be planted in medium- and long-staple varieties,

so that the United States may be assured of adequate supplies of the qualities needed to meet military requirements.

348. Long-Staple Cotton used in War Specialities Placed under Restrictions. (*Cotton*, M/c, 29/8/42, p. 6.) Reports from Memphis are to the effect that all long-staple cotton needed in the production of military fabrics, including barrage balloons, life rafts and parachute shroud lines, was recently put under rigid restrictions by the War Production Board. The delivery of cotton linters and hull fibre essential in the manufacture of chemical cotton pulp for explosives and plastics was also prohibited except to specified manufacturers. The restrictions already in effect on the better grades of imported Egyptian cotton were tightened up and also applied to American extra staple cotton. These restrictions now apply to Giza 7, Sudan, Sakha 3, Sakellaridis, Malaki and Karnak, all of which are Egyptian cottons, and also to SXP, Pima and Sea Island cotton grown in America. Pima is also produced in Peru and imported by the United States.

349. Cotton Spindles: Activity in the United States, 1932-41. Asscn. of Cotton Textile Merchants. (*Cotton*, U.S., **106**, 4, 1942, p. 98. From *Summ. Curr. Lit.*, xxii., 14, 1942, p. 342.) Statistics of spindle activity and cloth production are tabulated. " Spindles in place " have declined from 32,326,526 at the beginning of 1932 to 24,146,130 in 1942, but the percentage of " average active spindles " has risen from 71·92 to 93·53.

350. Textile Fibres: Consumption in United States, 1941. (*Rayon Organon*, **13**, 1942, p. 32. From *Summ. Curr. Lit.*, xxii., 5, 1942, p. 151.) Raw cotton consumption in 1941 reached the record of 5,207,200,000 lb., whilst wool consumption of 652,200,000 lb. was 54 per cent. greater than the previous record of 1923. The increase is due to military, naval and industrial demands and to an increase in civilian purchasing power.

351. Loss of American Cotton by Insects. (*Cotton*, M/c, 18/4/42, p. 6.) A conservative estimate is that, on an average, 1,500,000 bales of cotton worth $120,000,000 are lost each year to cotton-devouring insects. The number of bales destroyed in 1941 was even much greater. In addition, there are also destroyed 235,200,000 lb. of cottonseed oil worth $27,224,000; 117,675,000 lb. linters worth $8,237,250; 784,500 tons cottonseed meal worth $31,380,000; and 98,000 tons of cottonseed hulls worth $784,000. This totals up to a loss of $187,625,250, of which amount $75,000,000 is for Texas alone.

352. Industrial Fibre Society: Formation. (*Cotton*, U.S., **106**, 1, 1942, p. 64. From *Summ. Curr. Lit.*, xxii, 6, 1942, p. 152.) A brief report of the initial meeting of the Industrial Fibre Society which has been founded in America by a group of research physicists and chemists connected with southern textile plants. The purpose of the organization is to bring together the men in textile manufacturing plants and laboratories, and others who have a mutual interest in the technical side of textile fibres, to study the fibres, their uses and applications, etc. The initial meeting was attended by technical and research men and others from textile plants, technicians from government and other laboratories and from several educational institutions. The general theme of the meeting was " Evaluation and Correlation of Fibre and Yarn Properties " and discussions were held on the application of physics to fibre studies, the physical properties of cotton and their relation to factors governing utilization, the chemistry of the cotton fibre, chemical tests on the cotton fibre and their significance, and the correlation of fibre properties to yarn strength.

353. American Textile Schools: Organization. By D. E. Heard. (*Rayon Text. Monthly*, 23, 1942, pp. 75, 167, 295. From *Summ. Curr. Lit.*, xxii., 13, 1942, p. 317.) A general review of textile education in the United States, with particular reference to the organization of research. There are five important textile schools in the Eastern States and five in the South; they are briefly described.

354. Alabama: Avondale Mills: Management. By Avondale Mill Managers. (*Cotton*, U.S., **106**, 2, 1942, p. 82. From *Summ. Curr. Lit.*, xxii., 8, 1942, p. 177.) The Avondale Mills comprise a group of eleven mills, of which six are for spinning and the others do spinning, weaving, and dyeing and finishing. There are altogether 137,860 spindles and 4,330 looms, and a wide range of yarns and fabrics is produced. The organization of the mills is described by the managers in the following chapters: The management's viewpoint; Maintenance of buildings; Good housekeeping and maintenance of safe practices; Village maintenance; Maintenance of mill machinery; The Avondale research and testing laboratory; Maintenance of humidifiers and compressors; Maintenance of power and electrical equipment; Maintenance of fire-protection facilities. Many useful practical hints are given.

355. Georgia: Cotton Experiments, 1940-41. (*53rd Ann. Rpt., Exp. Sta. Ga.*, 1940-41, recently received.) In North Georgia Stoneville 2B and D. and P. L. 11A continued to be the most profitable varieties. Coker 100 also has a good record but is very susceptible to wilt. In South Georgia Coker 4 in 1, Coker Clevewilt 7, and Wannamaker Cleveland Wilt-Resistant maintained their superiority over other varieties, with a high wilt resistance, staple of 1 in. or over, and fair ginning outturn. Of the ⅞-in. cottons Rhyne Cook made the best showing, with good yields and excellent wilt resistance. A study of the reaction of cotton varieties to cotton wilt and root-knot nematode indicated no variety as immune to root-knot though some were highly resistant. In general, a close positive relationship existed between wilt resistance and root-knot resistance. Such varieties as Early Wilt, 4 in 1-3, 4 in 1-4, Cleveland W.R.6, Rhyne Cook, and Early Cleveland W.R. combine resistance to both pathogens. Treatment of seed with ceresan continued to be the most effective means of controlling anthracnose disease. Other work in connection with cotton carried out during the season included genetic studies, breeding experiments, varietal trials, fertilizer experiments and soil investigations.

356. Cotton Research Laboratory, New Orleans. (*Text. Manufr.*, January, 1942, p. 41.) Four regional research laboratories were authorized by the U.S. Agricultural Adjustment Act, 1938, " to conduct researches into and to develop new scientific, chemical and technical uses and new and extended markets and outlets for farm commodities, products and by-products." The New Orleans Station is now completed and equipped, and the work of the Cotton Fibre Research, Processing, and Chemical Finishing Divisions is briefly discussed. This research station is an American equivalent of the Shirley Institute of the British Cotton Industry Research Association.

357. Cotton Seed: Breeding in the Mississippi Delta. By M. G. Barnwell. (*Text. World*, **92**, 5, 1942, p. 73. From *Summ. Curr. Lit.*, xxii., 13, 1942, p. 293.) Cotton seed breeding in the United States is carried out by three distinct groups: (1) The Federal and State supported experiment stations, of which the Delta Experiment Station is a leading example; (2) Commercial breeders who supply pedigreed seed, selected, fumigated and scientifically packed, to cotton planters throughout the entire cotton belt as well as to foreign cotton-growing countries; (3) So-called multipliers or cotton planters who buy pedigreed seed from a certified breeder and sell, under certificate of the State Seed Improvement

Association, selected seed from their own planting, each bag of seed tagged to show its lineage. Brief accounts are given of the development and work of the Delta Experiment Station, the Delta and Pine Land Co., which developed Deltapine cotton, the Stoneville Pedigreed Seed Co., which produces seed of various types, the most important of which are Delfos and Stoneville 2B, the Robertshaw Plantation, which is developing a variety called Bobshaw, and Coker's Pedigreed Seed Co. of Hartsville, South Carolina. The improvements and profits made possible by the breeding work of the last 40 years are discussed.

358. Cotton Prospects in Oklahoma and Texas, 1942-43. (*Curr. Farm Econ.* Oklahoma Agr. Exp. Sta., June, 1942, p. 76.) "The outlook for the present crop is none too encouraging in Oklahoma and Texas, though other states are reporting satisfactory progress. Heavy and excessive rains plus a cold spring retarded planting by at least three weeks in most sections, and may likely prove detrimental to yields. Weevils do considerable damage to late cotton in eastern Oklahoma, and in the western section a late crop is subject to frost damage. Late cotton is usually low in grade and poor in staple character."

359. Quality-Price Relationships of Cotton at Local Markets in Oklahoma. By T. R. Hedges. (*Oklahoma Sta. Bull.* 250, 1941. From *Exp. Sta. Rec.*, **86**, 5, 1942, p. 695.) This investigation has shown that a policy of paying producers a set price for all grades of cotton, rather than varying prices for individual bales according to their quality, is detrimental both to the growers and to the industry. The policy penalizes producers of premium cotton and subsidizes those growing the low-quality cotton, thereby encouraging growers to increase the proportion of low-quality cotton in the total crop. This makes it harder and harder to find a market for Oklahoma cotton, and forces ginners to offset losses incurred in transactions in cotton with earnings from other departments of their businesses, and thus produces an artificial market for cotton.

360. Cotton Marketing in South Carolina. By W. T. Ferrier and H. A. White. (*S. Car. Sta. Bull.*, 335, 1941. From *Exp. Sta. Rec.*, **86**, 3, 1942, p. 406.) The study deals with the marketing of the 1939-40 crop. It analyses and discusses the price-quality relationships, losses resulting from gin damage, price variations due to transportation costs and to quality, and the production and demand and supply situation in the State. . . . The study confirmed previous findings of South Carolina and other State Experiment Stations and of the U.S. Department of Agriculture that prices paid in local markets are usually average or "round-lot" prices and do not reflect differences in quality of individual bales; that differences of quality as between growers are frequently not recognized; and that growers of poor-quality cotton are often overpaid while growers of high-quality cotton are underpaid. Differences ranging up to $5 per bale were paid in the same market on the same day for cotton identical in class. Variations in price were more often for differences in staple than for differences in grade. . . . Losses from bad ginning averaged $3.49-$4.42 per bale of the cotton so damaged in the four markets studied.

361. University of Tennessee Cotton Fibre Testing Service and Apparatus. (*Rayon Text. Monthly*, **22**, 1941, p. 734. From *J. Text. Inst.*, March, 1942. A140.) Scientific measurements of the length, fineness and strength of cotton fibres are offered by a new cotton-testing service inaugurated by the University of Tennessee Fibre Research Laboratory. The "Fibrograph" and the "Arealometer" will be used for measuring average fibre length and fineness and the "Pressley" instrument for testing the strength of fibres. With present facilities, the service can test and measure from 100 to 125 samples a day.

362. Texas: Cotton Experiments. By J. E. Roberts. (*53rd Ann. Rpt. Texas Agr. Exp. Sta.*, 1940, received 1942.) For the 14-year period (1927-40) treatment with 12 tons of manure and 400 lb. superphosphate to the acre produced the highest yield: 371 lb. lint to the acre, or 150 lb. more than the average of the plats which received no treatment, and 72 lb. more than the average of the five check plats which received 400 lb. of 4-12-4 commercial fertilizer to the acre. Treatment with 12 tons manure per acre produced the second greatest yield: 350 lb. lint. In an experiment carried out over the period of years to determine the relative merits of different nitrogenous fertilizers, nitrate of soda produced the highest yield: 285 lb. lint to the acre, and sulphate of ammonia a comparable yield of 272 lb. Those plats receiving the minor elements, boron and manganese, yielded 203 and 136 lb. lint per acre respectively.

In a varietal test carried out in 1940 of 54 varieties randomized in six replications, the highest yielding strains were: Washington, 220 lb. lint; Stoneville 2B, 218 lb.; D. and P. L. 44-51, 217 lb. lint per acre. On the basis of comparable yields among cottons grown for 10 years or longer, the highest yielding strains were: Ferguson 406, 248 lb. lint per acre; Startex 619, New Boykin, and Sunshine, each of which produced 233 lb. per acre.

363. Texas: Physical Characteristics in Cotton and their Interrelationship. By M. A. Grimes. (*53rd Ann. Rpt. Texas Agr. Exp. Sta.*, 1940, p. 114.) Succeeding generations of hybrid lines resulting from a cross of Lightning Express and Half-and-Half varieties (cotton furnished by the Division of Agronomy) were studied. It was found that the fibres of the Lightning Express parent were longer, finer and stronger than those of the Half-and-Half parent. The average length of the F_1 fibres was midway between the average lengths of the two parents; that of the backcross of the Lightning Express and F_1 was the same, and that of the F_2 generation nearly the same length as Lightning Express. The F_1 and F_2 generations were approximately midway between the two parents in fineness. The backcross was slightly finer than the finer parent, Lightning Express. The fibres of intermediate length had in general a higher percentage maturity than those of the longest and the shortest length. No inheritance of maturity was indicated. In each of the five lots of cotton there was a high positive correlation between length and fineness. Both length and fineness were closely correlated with strength. The F_1 and the backcross were approximately equal in strength. The strength of the F_2 was slightly less and that of the F_1 greater than the average of the two parents. In no case was it possible to assign a definite factorial or genetic basis for the inheritance of the several properties studied, although multiple factor independent inheritance was indicated.

[*Cf.* Abstr. **486**, Vol. XVIII. of this review.]

364. Texas: Breeding Cotton for Mechanical Harvesting. By D. T. Killough *et al.* (*53rd Ann. Rpt. Texas Agr. Exp. Sta.*, 1940, p. 66.) The desirable type of plant for mechanical harvesting should be characterized by medium height, relatively short noded fruiting branches, not more than one minor vegetative branch, open-type growth, light foliage with small leaves that shed early, and a medium-sized, strong storm-resistant boll, borne singly on a peduncle that snaps easily under tension. In addition, the fibre should be relatively harsh bodied, dense on the seed, of medium staple length, and have sufficient interseed drag to keep the locks relatively compact for best results in cleaning mechanically harvested cotton. Several promising hybrids bred at College Station and Lubbock appear relatively uniform for the desired characteristics: Half-and-Half × Acala, Ducona × Mebane 140, Clark × Acala, and Half-and-Half × Lone Star, all of which are characterized by a high mechanical

harvesting efficiency, good yield, good cleaning qualities, desirable staple length, and relatively high percentage of lint. The improved strains are being increased.

365. MILLER 610, A COMMERCIAL VARIETY OF WILT-RESISTANT COTTON FOR EAST TEXAS. By P. A. Young. (*53rd Ann. Rpt. Texas Agr. Exp. Sta.*, 1940, p. 222.) In the regional cotton variety wilt test conducted in coöperation with the U.S. Department of Agriculture, using 600 lb. of 6-6-6 and 6-12-6 fertilizer per acre in land heavily infested with *Fusarium vasinfectum*, Miller 610 cotton averaged 2,027 lb. seed cotton per acre, which was 82 per cent. more than the yield of comparable Half-and-Half cotton. Dixie Triumph 06 yielded 1,898 lb. seed cotton and Wannamaker's Early Wilt Resistant cotton 1,828 lb. seed cotton per acre. All varieties yielded better with 6-6-6 than with 6-12-6 fertilizer, possibly due to excess phosphate from residue in the soil. Miller 610 appears well adapted and valuable for commercial use in East Texas as it has shown strong wilt resistance, long staple, large bolls, and high yielding capacity in dry and wet seasons of the last four years. It has been satisfactory in commercial tests for the last three years.

366. COST AND PROFIT OF GINNING COTTON IN TEXAS. By W. E. Paulson. (*Bull.* 606. *Texas Agr. Exp. Sta.*, 1942.) A comprehensive analysis is presented of the cotton-ginning business in Texas, with especial emphasis on costs and profits. It has been prepared primarily for students of the ginning business. The controlling influence of volume of ginning and investment in the gin plant on the cost and profit of ginning is analysed. The parts played by fixed cost and by variable cost in the cost and profit of ginning, the factors underlying the success of an individual ginner, and the fundamental aspects of a successful ginning business in Texas, are discussed.

367. TEXAS: MICROBIAL RESPONSES TO ORGANIC AMENDMENTS IN HOUSTON BLACK CLAY. By R. B. Mitchell *et al.* (*J. Agr. Res.*, **63**, 9, 1941, p. 527.) Curves for temperature, moisture, and microbial numbers were established for selected plots of Houston soil as a background for studies in cotton root rot control. As an environment for microbial activity the plots of Houston soil studied furnish the following striking features: In a period between early December and February the temperatures remained below those required for active microbial multiplication, yet without freezing. Temperatures ranged above 70° F. from March to November, and from 80° to 90° from June to October. Bacteria and actinomycetes are much more active and abundant than has been reported for northern soils. Maxima for total colony counts in soils receiving organic amendments reach 200 to 400 millions; actinomycetes at times reach 50 and 90 millions to the gram. Such responses to added organic nutrients present a challenge to the worker to search for organic media and agronomic practices capable of yielding a controlled microflora.

COTTON IN EGYPT.

368. EGYPTIAN COTTON: SPINNING QUALITY AND MARKETING. By H. A. Hancock. (*Text. Wkly.*, **29**, 1942, p. 262. From *J. Text. Inst.*, April, 1942, A166.) Prior to the collapse of France, cotton was moving out of Egypt at an unusually fast rate, but this movement stopped with the restriction on shipping, and the mere storing of cotton and seed has now become a problem. A British Government Cotton Buying Commission was set up which bought about 900,000 bales (of 733 lb.) amounting to about three-quarters of the 1940 crop, the rest being absorbed by export houses and local mills. About one-half of the supply was exported or consumed during the season, leaving a carry-over not so large as had been feared. The first official estimate of 1941 production was

1,110,000 bales, and the 1941-42 season opened with about $1\frac{1}{2}$ times the normal supply of cotton in sight. The cotton stored in Egypt contains a high proportion of shorter-stapled varieties, more than three-quarters being Uppers or Zagora-Ashmouni. For the 1941-42 season a new buying commission has been set up jointly by the British and Egyptian Governments, buying at prices uniformly one penny per pound above the preceding prices for all grades. Legislation is in progress to restrict the acreage planted. An increase in the proportion of long-stapled cotton as a result of expansion of the growth of the new long-stapled variety, Karnak (Giza 29), is anticipated. Karnak is about the same quality as Sakel but gives a much higher yield and, because of its lower cost of production, is offered at a lower price than Sakel. Tables are given showing lea strength of 60's ring twist, staple length, hair weight per cm., relative price, 1941-42 supply, and maximum counts spinnable for different grades, for the various Egyptian cottons, including Karnak.

369. New Varieties of Cotton. By M. A. El-Kilani. (*Spec. Suppl. Egypt. Agr. Mag.*, 1941, p. 19. From *Pl. Bre. Abs.*, xii., 2, 1942, p. 140.) The author, reviewing the work that has been done by the Plant Breeding Section on cotton improvement, outlines the methods used. The first is by selection within the prevailing varieties to produce new strains or varieties which exceed the originals in yield and quality. The second is by hybridization, natural or artificial, to develop new varieties which surpass the parents. Since the occurrence of natural hybridization is rare and its results are uncertain, the plant breeder relies on artificial hybridization to produce new varieties which combine the best qualities of the parents. The author continues by describing the new varieties produced by these two methods. Malaki, Karnak and Giza 36 were produced by artificial hybridization and Giza 31 by selection. However, these varieties are not yet on the market and are still under propagation. Malaki is a hybrid from Sakha 10 and Sakel, with staple length 39-40 mm., ginning outturn and yield equal to Sakel, fibre colour like Maarad, and remarkable spinning qualities; it is susceptible to wilt disease. Karnak is a hybrid from Maarad and Sakha 3 (selected from Sakel); fibre colour slightly dark, yield and ginning outturn higher than any other long-staple varieties, staple length 37 mm., resistant to wilt disease, and spinning qualities equal to those of Sakel. Giza 36 is a hybrid from Giza 12 and Sakha 3, combines high yield and high ginning outturn (10 per cent. higher than Sakel), staple length 36 mm., spinning quality as good as that of Sakel, and high immunity against wilt. Giza 31 was selected from Ashmouni, exceeds the latter in yield and fibre qualities and is early maturing and resistant to the high temperature of Upper Egypt.

COTTON IN OTHER FOREIGN COUNTRIES.

370. Argentina: La Determinacion de la Calidad del Algodon. By U. A. Verges. (*Bol. Mens.* No. 76, *Junta Nac. del Algodon*, Buenos Aires, 1941, p. 634.) Discusses the precautions necessary in picking and ginning to ensure good quality in cotton; the classification of cotton according to grade, staple length and character; the extraction of samples; the commercial classification of Argentine cotton and Argentine standards of grade; determination of the price of the fibre; disadvantages of selling as seed cotton; methods of marketing cotton fibre, and the utilization of fibre and seed products. The possibilities of cotton cultivation in Villa Dolores (Cordoba) are also discussed. The cotton of this region is stated to be of high grade and good character, with an average staple length of 26 mm. and a ginning outturn of 34·6. It is considered superior to most Argentine cottons.

371. Cotton Cultivation in Argentina (Roque Saenz Peña Presidency). By J. R. Báez. (*Bol. Mens.* No. 74, *Junta Nac. del Algodon*, Buenos Aires, 1941, p. 455. From *Summ. Curr. Lit.*, xxii., **5**, 1942, p. 110.) An account of the topographical features, vegetation, soil and climate of the Roque Saenz Pena Presidency which lies in the centre of the cotton-growing district of the Chaco. Temperature, rainfall, relative humidity, wind direction and other statistics for recent years are given. The cultivation of cotton in this region is discussed and the prevailing conditions are compared with the requirements of the cotton plant at each stage of its growth. Conditions are favourable but margins are not sufficiently ample to ensure that yields will always be high. Careful selection of types characterized by earliness and good yield is recommended. The varieties at present cultivated include the Chaco type and North American varieties such as Acala, Delta, Pine Land, Farm Relief, etc. The area under cotton in the Chaco has increased from 2,800 hectares in 1916-17 to 299,000 hectares in 1937-38.

372. Argentina: Cotton in Tucuman. By W. E. Cross. (*Mem. An. del año* 1940. From *Pl. Bre. Abs.*, xii., **2**, 1942, p. 108.) The most promising of the crosses appears to be Tucuman Cl × Acala Roger Improved. Improved selections have been obtained from Tucuman Cl and Lightning Express. The experiments on treating seeds with colchicine have been continued and the variety collection maintained.

373. Boletin Mensual. (Min. de Agr., Junta Nac. del Algodon, Buenos Aires, 1941.) *Bulls. Nos.* 75-80 (79 not received) contain the following among other articles in Spanish: "The history of cotton in Argentina"; "The prospects for Argentine cotton in the Spanish market" (C. M. Llerena); "Some aspects of agricultural mechanization" (T. Barañao); "Proposed establishment of an Insectarium (in Roque Saenz Peña Presidency) and its functions" (R. G. Mallo)—to study pink bollworm and to breed parasites for its control; "Ginning of cotton" (C. A. Padilla); "Preparation of the ground for cotton planting in the United States" (J. A. Llosa); "Disinfection of cotton seed" (R. G. Mallo); "The encouragement of cotton cultivation in Cordoba"; "The mechanization of cotton cultivation" (J. A. Llosa); "Visit to the Chaco of the Minister of Agriculture"; "Cotton diseases in the Argentine Republic" (M. Di Fonzo)—a well-illustrated paper dealing with cotton diseases and their control. *Bulls. Nos.* 81-2, 83-4, 1942, include the following among other papers in Spanish: "The cotton industry and its influence on national economic development" (A. Dorfman); "The treatment of cotton seed with various anticryptogamic products" (M. Di Fonzo); "Insecticides for pink bollworm control" (A. S. Chapman and W. L. Lowry); "Notes on parasites of the cotton pests *Alabama argillacea* and *Platyedra gossypiella*" (P. C. L. Denier). Statistics are also included of acreage, production, prices, exports, etc.

374. Brazil: Cotton Industry, 1941-42. (*S. Amer. Jour.*, 15/8/42.) The first official estimate for the 1941-42 cotton crop of southern Brazil is approximately 342,000 tons. The quality of the current crop of São Paulo has suffered from excessive rains during the maturing and picking seasons. The third official estimate of 1941-42 production in northern Brazil is given as 107,148 tons. This crop was damaged by dry weather and is much below the previous season's output. The marketing prospects are uncertain because of the limited number of export markets, the shipping situation, and the prospective large surplus of low-grade cotton. The loss of the Far Eastern markets constitutes the greatest problem.

in crust formation is the presence of fine particles greater than 0·01 mm. in diameter. Crusts are formed on structureless fine-grained soils possessing plasticity when wet. Salts in the soil solution are not important in crust formation. Although they cause a disaggregation of micro-aggregates this has little effect on the final setting of the soil. The greater the number of fine particles in the soil and the slower the movement of water in the capillaries during evaporation the more marked is the difference in the moisture of contiguous soil layers, this being the principal cause of cracks appearing on the surface of the soil. The quantity and quality of the humus are important, but in structureless fine-grained soils crusts are formed regardless of the humus content.

381. An Important Effect of Soil Colloids on Plant Growth. By J. S. Papadakis. (*Soil Sci.*, **52**, 4, 1941, p. 283. From *Exp. Sta. Rec.*, **87**, 1, 1942, p. 25.) Culture solutions in which roots had been grown were found deleterious to other plants, and increasing the number of plants growing in a solution decreased the yield. These effects were experimentally shown not to be attributable to exhaustion of nutrients. Experiments with mixtures of fine gravel and fine soil showed that plant yields increased considerably when the proportion of fine materials increased, the increment being greater with high levels of nutrients or moisture than with low levels. The effect of increasing the proportion of fine soil, though slight at the beginning, became more and more pronounced as growth advanced. As an explanation of these observations the author holds that soil colloids absorb the living root toxins and aid in their oxidation, and that, in addition to their influence on the chemical and physical properties of the soil, soil colloids increase the available space. With the highest levels of nitrogen, phosphorus and water, the yield increased in the corn experiment from 3·78 to 27·26 gm. per pot when the proportion of fine soil increased from 10 to 40 per cent.

382. The Measurement of Structural Stability and Permeability and the Influence of Soil Treatments upon these Properties. By R. B. Alderfer and F. G. Merkle. (*Soil Sci.*, 51, 1941, p. 201. From *Trop. Agr.*, February, 1942, p. 38.) A method is described which is sufficiently refined to reveal the small alterations in aggregate size and stability that may be produced within a single soil type by different soil treatments through variations in cultural practice, fertilization, erosion, etc. A numerical measure of the structural stability of the aggregates and the probable permeability of soils is presented. When the method was used to study differences in structure and permeability produced by cropping systems, fertilizing, and liming, it was shown that on a single soil—(*a*) a rotation of corn, oats, wheat and clover over a period of 58 years caused a breakdown of aggregates as compared with sod land adjacent; (*b*) a vegetable cropping system including no sod crop, and with cover crops only for soil improvement, produced after 21 years a poorer structural condition than the rotation described in (*a*); (*c*) farm manure whenever used produced definite physical improvement; (*d*) liming did not significantly alter the structural condition; (*e*) other things being equal, structural stability is closely correlated with the organic content; (*f*) the volume weight exhibits a significant inverse relationship with structural stability, probable permeability, and organic content.

383. Effect of Structure of Artificial Rain on Character of the Moistening and on the Agro-Physical Properties of the Soil. (*Br. Chem. Phys. Abstrs. B. III*, p. 310. From *Trop. Agr.*, August, 1942, p. 164.) Intensification of the spray when using sprinkling irrigation destroys soil structure, decreases depth of water penetration, and increases run-off. Increasing the size of drops in the spray also increases the destructive effect on soil structure. The optimum intensity of spray is 0·2 mm./min., at which rate no destruction of soil

structure takes place, but small aggregates are formed and a maximum depth of penetration results. The optimum diameter for the drops in the spray was 2-3 mm.

384. SOIL CONSERVATION AND LAND USE STUDIES. (*U.S. Dept. Agr., Sec. Agr. Rpt.*, 1941, p. 176. From *Exp. Sta. Rec.*, **86**, 6, 1942, p. 744.) This report takes up the great costs incurred through soil losses, the preparation of land-use-capability maps, and tillage by conservational methods. Control of floods by land treatments is also dealt with, an appraisal of benefits is made, and the national defence aspect is discussed.

385. DISPERSION STUDIES ON GEZIRA SOIL. By T. N. Jewitt. (*J. Agr. Sci.* [England], **31**, 4, 1941, p. 466. From *Exp. Sta. Rec.*, **86**, 6, 1942, p. 745.) The relation of initial moisture content to the degree of dispersion on shaking of the heavy clay Gezira soil is given. A minimum dispersibility was found at about 7 per cent. of initial moisture content. The relation between dispersion and water content is discussed in connection with possible effects in field practice.

386. MEASURES AND PRACTICES FOR CONTROLLING EROSION AND CONSERVING WATER. By C. R. Enlow. (*Monthly Bull. Agr. Sci. and Prac.*, xxxii., **12**, Rome, 1941, p. 379T.) The paper describes the manner in which various conservation measures are applied to individual farms in the work of the U.S. Soil Conservation Service. The technique has been developed by applying research results and by evaluating conservation measures in operation during the past 8 years. The paper discusses the necessity of securing information on the physical resources of each farm, the classification of the land as suitable, or unsuitable, for cultivation, and the question of farm planning. A list is given of some thirty measures and practices of value in conserving soil and water.

387. SOIL EROSION IN CHINA. By T. M. Tieh. (*Geog. Rev.*, **31**, 4, 1941, p. 570. From *Exp. Sta. Rec.*, **86**, 6, 1942, p. 745.) Discusses climate, soils, and vegetative cover, and the extent of soil erosion and its control.

388. INFLUENCE OF MICRO-ORGANISMS ON SOIL AGGREGATION AND EROSION. II. By J. P. Martin and S. A. Waksman. (*Soil Sci.*, **52**, 5, 1941, p. 381. From *Exp. Sta. Rec.*, **87**, 1, 1942, p. 28.) The action of micro-organisms in Bermudian clay loam and Collington sandy loam was found, in a continuation of previous work, to result in a marked aggregation of the soil particles. .The extent of aggregation depended upon the nature of the organic and inorganic materials added. Alfalfa and straw were more effective than manure, which, in turn, was more effective than peat or lignin in establishing aggregates. Complex organic materials, together with lime, maintained a better state of aggregation of the clay-loam soil than did the organic substances alone. Lime alone exerted a small and gradually increasing effect upon the silt and clay particles of the moist soil. This effect was not so apparent after the soil was dried. The dried soil receiving lime showed an increase in the percentage of very small aggregates only. Lignin and casein together produced greater aggregation in the clay soil than did casein alone, as determined by tests on the moist soil. After the soil was dried, the effects of casein alone appeared to be greater than the effects of casein and lignin used in combination.

[*Cf.* Abstr. **361**, Vol. XVIII. of this Review.)

389. A CONVENIENT SOIL-CULTURE METHOD FOR OBTAINING SCLEROTIA OF THE COTTON ROOT ROT FUNGUS. By A. A. Dunlap. (*Amer. J. Bot.*, **28**, 1941, p. 945. From *Circ.* 96, p. 25. Texas Agr. Exp. Sta., 1942.) Sclerotia of the cotton root rot fungus, *Phymatotrichum omnivorum*, have been consistently obtained in sterile-soil cultures with a nutrient added, such as seeds of sorghum,

cotton, bean, or cowpea. This method has been found effective under a wide range of moisture, nutrient, temperature and soil conditions. Variations in size of sclerotial masses were noted with different types of nutrients and when sand was used in place of soil.

390. Soil and Fertilizer Investigations of the Bureau of Plant Industry. (*U.S. Dpt. Agr., Bur. Pl. Indus. Rpt.*, 1941. From *Exp. Sta. Rec.*, **86**, 6, 1942, p. 740.) Fertilizer research is reported on the following: The production of phosphate fertilizer and hydrogen for ammonia by the substitution of steam for air in blast-furnace methods for treating phosphate rock, the development of a method of granulation of potassium chloride, and the status of the use of mixed and high analysis fertilizers. (R. O. E. Davis.) Soil chemistry investigations are reported as follows: The boron content of different soils throughout the United States, a method for the determination of fluorine in soils, and the possibility of the use of hickory leaves as an indicator plant to determine the availability of certain trace elements. (H. G. Byers.) Soil microbiology investigations are reported on the inoculation of winter legumes and the effect of certain minor elements on nitrogen fixation. (C. Thom.)

391. Conserving Soil and Water with Stubble Mulch. By H. H. Bennett. (*Agr. Eng.*, **23**, 2, 1942, p. 37. From *Exp. Sta. Rec.*, **87**, 1, 1942, p. 122.) "Stubble mulch" is defined as a process of protecting cultivated or bare land in such a way as to conserve soil and soil moisture and reduce evaporation through the use of a complete or partial surface covering composed of some form of crop stubble or residue. The primary process consists in merely stirring the soil with ploughs without mouldboards. It leaves much of the vegetative material—crop residue or vegetative litter—on the land as a surface protection against erosion. Comparing this treatment with that of basin listing, the author cites the observation at Lincoln, Nebraska, that applying 2 tons of wheat straw per acre and ploughing with a blade or winged implement a few inches beneath the surface, without turning the straw under, conserved 54 per cent. of the rainfall. Under comparable or duplicate conditions, only 20·7 per cent. of the rainfall was conserved with ordinary summer fallow, and only 27·7 per cent. with basin listing, even though the basin listing permitted virtually no run-off, since the losses due to evaporation from the convoluted bare surface tended to offset the gains due to prevention of run-off.

392. The Utilization by Cotton of the Nutrient Substances in Fertilizers. (*Chem. of Soc. Agr.*, No. 6, 1940. In Russian. From *Cott. Lit.*, February, 1942, p. 39.) In a series of 4-year experiments applied N was utilized to the extent of 30-100 per cent., applied P 15-30 per cent., applied K 70-80 per cent. Mineral N was utilized more fully than organic N; P from farmyard manure was more fully utilized than mineral P. A combination of organic and mineral fertilizers is recommended.

393. Studies on Physico-Chemical Changes in Black Cotton Soil during Nitrification. By M. Prasad and N. K. Patwardhan. (*Ind. J. Agr. Sci.*, xi., 6, 1941, p. 978.) A study of some properties of the black cotton soil as nitrification proceeds in the untreated soil and in soil treated with two different doses of ammonium sulphate. The experiments were conducted at the Indore Institute of Plant Industry for a period of four months, during the Bombay monsoon. Trays containing untreated soil and soil treated with 25 lb. and 50 lb. of N-equivalent of ammonium sulphate (Merck's A.R. quality) per acre of 6 inches deep soil, were arranged in two well-ventilated chambers with glass doors. Samples (12 at a time) were withdrawn and analysed every month for ammoniacal nitrogen, nitrate nitrogen, organic carbon, C/N ratio, and hygroscopic moisture;

and every two months for base exchange capacity, total and individual replaceable bases, available phosphoric acid (P_2O_5), aggregate analysis and resistance to water (structure coefficient). The results, which are tabulated and discussed, show that many of the improvements in the soil properties take place during the first two months after the treatment. Thus, the amount of nitrate supposed to have an adverse effect on soil is least in this period, and increases only after three months from the start. The ammoniacal nitrogen is in equilibrium with the nitrate nitrogen. The organic carbon increases during the first two months as a result of the formation of algæ. The C/N ratio remains fairly steady and the available P_2O_5 content does not appear to have any correlation with the nitrate nitrogen. Base exchange capacity, total exchangeable bases and the exchangeable calcium increase in the first two months and then decrease. Replaceable sodium and potassium decrease both with the treatment and time, while exchangeable magnesium decreases only with time and not with the treatment. The hygroscopic moisture increases in the first two months, but treatment with ammonium sulphate produces no changes in the clay content of the soil or in the structure coefficients. To sum up, the application of ammonium sulphate in doses used in the experiment increases soil fertility and productivity and causes no deterioration in the soil structure of a permanent nature.

394. Ant Heaps as Fertilizer. (*Crown Col.*, September, 1942, p. 568.) Describes a unique method of maintaining soil fertility, practised by the inhabitants of a village in the Minna Division of the Niger Province, which was encountered by an officer of the Nigerian Forestry Department. Writing in *Farm and Forest* he says that in addition to rotating crops and arranging annually for Fulani to kraal on their land, the farmers used termite mounds. The red ant heaps are turned over and exposed to the sun to drive out the ants. They are then pulverized and scattered over the ground. These ant heaps, the farmers maintained, helped in manuring the land. The farm examined, some 50 acres in extent, had been under continuous cultivation for 15 years, yielding good crops of guinea corn, hungry rice, maize and groundnuts. The soil showed no signs of exhaustion.

395. Cotton Plant: Response to Phosphatic Manures. By W. B. Andrews. (*J. Assoc. Offic. Agr. Chem.*, 25, 1942, p. 498. From *Summ. Curr. Lit.*, xxii., 15, 1942, p. 343.) Since 1928 much use has been made of superphosphate manures that have been "ammoniated" to various nitrogen contents. There is some evidence that official analytical methods for evaluating phosphatic manures undervalue these ammoniated products, and the present paper is a critical enquiry into the question. For the cotton grower its chief interest lies in the results of many manuring experiments in different parts of the American Cotton Belt, and especially in a table that gives the average increase in yield of seed cotton produced on soils of different types by superphosphate, various ammoniated superphosphates, tricalcium phosphate, and mixtures with marble or dolomite dust.

396. A Review of the Manurial Experiments with Cotton in India with Suggestions for the Future. By D. V. Bal. (C.P. and Berar.) (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, p. 107.) The specific needs of the various soils having been determined some general questions are suggested for investigation.

397. A Note on Cotton Manuring Trials in India. By V. G. Panse. (Indore.) (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, p. 108.) A general discussion of the subject, inviting the co-operation of research workers in the planning of

manurial trials. Previous results require confirmation by a new series of well-planned trials capable of being examined by proper statistical methods.

398. COMPOST AND THE COTTON CROP. By A. Sreenivasan. (Indore.) (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, p. 118.) From experiments made at Indore since 1932 with compost and inorganic fertilizers the general experience has been that on rich and well-drained fields and in fields protected from erosion the latter always increased the yield of cotton profitably and compost seldom, while on fields of opposite character treatment with compost was beneficial and inorganics either failed altogether or were unprofitable. Composts cannot properly be compared with artificials for the reason that the former act predominantly as suppliers of humus and only incidentally as sources of plant nutrients. Their functions are really complementary. The residual effect of compost is always very marked.

399. KRAAL COMPOST. By S. D. Timson. (*Rhod. Agr. J.*, May-June, 1942, p. 161.) A general description of the method of making compost and of the raw materials required.

400. THE CHEMISTRY AND TOXICITY OF SELENIUM COMPOUNDS, WITH SPECIAL REFERENCE TO THE SELENIUM PROBLEM. By E. P. Painter. (*Chem. Rev.*, **28**, 2, 1941, p. 179. From *Exp. Sta. Rec.*, **86**, 6, 1942, p. 727.) A critical survey of the literature through 1940 on organic selenium compounds and their toxicity, with especial reference to the nature of the form in which selenium occurs in seleniferous plants and grains. The subject-matter is discussed under the four headings: the selenium problem in agriculture, methods of analysis, organic compounds of selenium, and the properties of selenium in plants and their relation to known compounds of selenium and sulphur. 186 references are appended.

STATISTICAL TREATMENT, CULTIVATION, IRRIGATION, GINNING, ETC.

401. THE RELATION BETWEEN THE DESIGN OF AN EXPERIMENT AND THE ANALYSIS OF VARIANCE. By A. E. Brandt. (*J. Amer. Statist. Ass.*, 36, 1941, p. 283. From *Pl. Bre. Abs.*, xii., 3, 1942, p. 165.) With the modern development of design of field experiments the analysis of variance has become of a more complex character. In such experiments a large number of treatments are tested simultaneously and the analysis of, say, yields from such experiments should produce estimates of yield increase for each of the treatments tested. These estimates of what are called "individual treatment effects" are the basic idea of the analysis of variance of modern designs as developed by Fisher and Yates. The author shows how the idea may be extended, and produces a general scheme for the computation of all "effects" in a general analysis of variance. Although the method is cumbersome where large-scale experiments are to be analysed, it is instructive and self-checking. It should also be of interest to those concerned with mechanical methods of computing.

[*Cf.* Abstrs. **97**, Vol. XIII., **463**, Vol. XIV., and **101**, Vol. XV. of this Review.]

402. STUDIES IN THE TECHNIQUE OF FIELD EXPERIMENTS. V. SIZE AND SHAPE OF BLOCKS AND ARRANGEMENT OF PLOTS IN COTTON TRIALS. By V. G. Panse. (*Ind. J. Agr. Sci.*, xi., 6, 1941, p. 850.) The relation between block size and experimental error is important in planning agricultural trials. A uniformity trial on Malvi cotton was examined to study the question by combining plots of $\frac{1}{50}$, $\frac{1}{100}$, $\frac{1}{200}$ and $\frac{1}{500}$ acre size into blocks of varying sizes. There is a general decrease of block efficiency with increasing block size. More compact blocks of the same size show a higher efficiency. Blocks of identical size and shape but

consisting of long plots also show a somewhat higher efficiency than blocks with short plots of the same size. Arrangement of plots in more than one row decreases block efficiency and the effect is more pronounced with long plots. A logarithmic relationship is shown to exist between block efficiency and experimental error; but larger and longer plots give a lower error irrespective of block efficiency. In determining experimental error plot size and shape are therefore of greater importance than block efficiency. The number of replications and total area of land required to give a 4 per cent. error of the mean were calculated. For the same number of plots per block, smaller plots require more replication but less total area than larger plots. With all plot sizes except the largest, and with 16 or more plots to a replicate, there is a gain in efficiency by confounding; but a quasi-factorial arrangement for only 16 varieties was found less efficient than simple randomized blocks. Factors influencing the choice of design for agronomic and varietal trials of different sizes are discussed.

[*Cf.* Abstrs. **264**, **449**, Vol. XIII. of this Review.]

403. Tetrachloro-para-benzoquinone, an Effective Organic Seed Protectant. By E. L. Felix. (Abstr. in *Phytopathology*, xxxii., 1, 1942, p. 4. From *Rev. App. Mycol.*, xxi., 6, 1942, p. 298.) Damping-off of cotton (*Pythium* spp., *Corticium solani*, and other fungi) was effectively combated in flats of Mississippi cotton soil by the treatment of machine-delinted seed at the rate of 3 oz. undiluted or 4-6 oz. 25 per cent. Spergon in talc per bushel of seed. Spergon is a commercial preparation containing 99 per cent. tetrachloro-para-benzoquinone as the active ingredient.

404. Factors affecting the Longevity of Cottonseed. By D. M. Simpson. (*J. Agr. Res.*, **64**, 7, 1942, p. 407.) The longevity of cottonseed is definitely dependent upon the moisture content of the seeds and the temperature conditions under which the seeds are stored. The studies here reported deal with the effects of moisture alone under " normal" storage temperatures and with the combined effects of controlled moisture-temperature conditions. In ordinary storage, seeds quickly reach a moisture content in equilibrium with that of the storage environment. In storage experiments with Upland and Sea Island cotton seed under the humid and fairly high temperature conditions prevailing near Charleston, South Carolina, seeds in bags deteriorated rapidly after 2 years, but seeds with a moisture content reduced below 8 per cent., and stored in tin containers to prevent the rapid reabsorption of moisture, retained their viability with only slight impairment for 7 years, and a few seeds were still germinable after 10 years' storage. Lots of Upland and Sea Island cottonseed sealed in glass jars and containing 11 per cent. moisture were worthless for planting purposes after 2 years' storage, but other lots, especially of the Sea Island seeds, containing 6 and 8 per cent. moisture, showed a high percentage of viable seeds after 7½ years' storage. Thus, cottonseed containing less than 8 per cent. moisture apparently does not require aeration and can be kept viable for many years in airtight containers even at the temperatures that prevail along the Coastal Plain. Cottonseed of two Upland varieties was adjusted to several levels of moisture ranging from 7 to 14 per cent. and stored at constant temperatures of 90°, 70°, and 33° F. Corresponding checks were subjected to normal fluctuating temperatures at Knoxville, Tennessee. The seeds stored at 90° deteriorated rapidly, those containing 14 per cent. moisture were all dead in 4 months, and after 36 months' storage only those seeds with 7 per cent. moisture were germinable, and their viability was impaired. In contrast, seeds stored at 33°, even with 14 per cent. moisture, retained their viability for 36 months without appreciable impairment. Seeds stored at air temperature and at 70° were somewhat intermediate with respect to moisture tolerance. The higher moisture lots deteriorated less

rapidly at 70°. than at air temperature. If the moisture content is low cotton seeds can withstand high temperatures without rapid deterioration, and if the temperature is kept low they are tolerant of high moisture, but both temperature and moisture cannot be high if rapid deterioration is to be prevented. In field germination tests, the percentage of seedling mortality was greater from seeds stored at 33° F. than from seeds stored at higher temperatures. Apparently the low storage temperature was also favourable for the survival of anthracnose spores on the seeds. Analyses of stored seeds showed that with increased seed moisture or increased storage temperature there was a corresponding increase in the percentage of free fatty acids in the oil.

405. COTTONSEED: QUALITY TESTING. By N. Reichart. (*Bol. Mens.* No. 73, *Junta Nac. del Algodon,* Buenos Aires, 1941, p. 390. From *Summ. Curr. Lit.*, xxii., 5, 1942, p. 110.) An account of Simpson's work on the influence of climatic conditions and of storage on the viability of cottonseed, and of Meloy's studies of quality based on determinations of the free fatty acid content of seeds. It is recommended that tests of germinating power should be accompanied by determinations of moisture content, and that seed containing more than 12 per cent. of moisture should be discarded since it will deteriorate on storing. The Simpson and Chester techniques for the determination of germinating power are outlined.

[*Cf.* Abstrs. **582**, **583**, Vol. XII., and **106**, Vol. XIII. of this Review.]

406. LA BATATA COMO CULTIVO SUCESIVO AL ALGODON. By E. Molinary Salés. (*Agr. Exp.* [*Puerto Rico Univ. Sta.*], **1**, 5, 1941, p. 6. From *Exp. Sta. Rec.*, **86**, 5, 1942, p. 621.) The sweet potato, especially the Don Juan variety, is indicated as a good crop to follow Sea Island cotton because of rapid growth and response to fertilizer residues left by the cotton. Since the sweet potato belongs to a family unrelated to cotton, it would not be liable to introduce certain insects and diseases into the rotation.

407. COTTON-PICKING MACHINE. International Harvester Co., New Jersey. (U.S.P. 2,247,686. From *J. Text. Inst.*, April, 1942, A169.) A cotton-picking machine has rotatable conical spindles tilted at an angle such that one end of each moves through a plane, and formed with steep spiral rows of teeth set at a small angle to the axis of the spindles. A circular doffer is arranged so that it makes contact with the teeth on the spindles from the outer end towards the base and substantially parallel to the row of teeth.

408. COTTON-PICKING MACHINE DOFFING UNIT. International Harvester Co., New Jersey. (U.S.P. 2,247,682. From *J. Text. Inst.*, April, 1942, A168.) A doffing unit for a cotton picker of the rotating spindle type comprises a disc-like support carrying a number of lugs projecting at the circumference, a doffer element consisting of resilient material that fits over the lugs and is joined up by a web, and an annular securing element having projections fitting against the web connecting portions between the lugs.

409. THE WORK OF THE UNITED STATES COTTON GINNING LABORATORY. (*U.S. Dpt. Agr., Misc. Pub.* 445, 1941, p. 28. From *Exp. Sta. Rec.*, **86**, 4, 1942, p. 539.) This is mainly a popular account of the purpose, equipment, and accomplished work of the ginning laboratory at Stoneville, Miss. The study of the cotton before ginning has shown that trash brought in by careless picking may cause losses as much as $5 per bale, and that the most complete cleaning equipment does not entirely offset the results of careless picking. Development of mechanical driers which increase the value of the ginned lint by from 70 c. to $2.50, according to staple length, at a fuel cost often less than 15 c. per bale, is mentioned, together with increases up to nearly 20 per cent. in gin capacity brought about by raising saw speeds from 400 to 600 r.p.m. at a cost negligible in comparison with the gain

in value of the cotton gin which may be obtained from this change and from the concomitant use of looser seed rolls. Study of the effects of variations in gin-saw design and the importance to proper doffing of keeping the brush drums and brushes in good repair are also taken up, as are packaging improvements, pure-seed handling equipment, reduction in power wastes, etc.

410. Cotton from Boll to Bale. By F. L. Gerdes *et al.* (*U.S. Dpt. Agr., Leaflet* 211, 1941. From *Exp. Sta. Rec.*, **86**, 4, 1942, p. 471.) The harvesting and handling practices described, and considered essential in producing maximum values of ginned lint and seed, include picking dry or drying after picking, picking clean and before undue field exposure, keeping separate (or thoroughly mixing) seed of unlike quality, bringing in loads of seed cotton to produce bales weighing about 500 lb., use of modern gin equipment, and careful handling and storage of baled cotton.

411. Cotton Ginning Improvements in 1941. By F. L. Gerdes. (*Cott. Ginners' Jour.*, March, 1942. From *Cott. Lit.*, April, 1942, p. 123.) Brief report of new gin installations in the United States. A table is included showing the number of cotton gins in the United States equipped with driers from 1935 to 1941.

412. Cotton Gins: Power Requirements. By V. L. Stredousky *et al.* (*U.S. Dpt. Agr. Circ. No.* 60, 1941. From *Summ. Curr. Lit.*, xxii., 12, 1942, p. 272.) With the aim of reducing the waste of power in driving cotton gins, a power survey has been made at 63 representative ginneries in the Yazoo-Mississippi Delta. This survey showed that on the average about 40 per cent. of the power used for ginning was consumed by fans and 60 per cent. by the stands, separators, feeders, cleaners, presses and other equipment. The average fan in a gin required horse-power per stand as follows: air-blast fans, 4·7; suction and seed-blowing fans, 5·7; standard suction fans, 4·6; Rembert type unloading fans, 5·3; seed-blowing fans, 3; drier fans, 3·6; and hull fans, 1·3. Means by which ginners can effect savings in power are discussed.

413. Effect of Cottonseed Disinfection on Yield. By J. F. Dastur. (*Ind. Jour. Agr. Sci.*, xii., 11, 1942, p. 364.) Experiments carried out over several years on various government farms in India indicate that the chemical treatment of cottonseed increases the yields of seed cotton. The percentage increase in yield at each station is shown by means of tables. Treatment of seed with fungicides also aids in the control of anthracnose and other fungus diseases. Good results were obtained with Agrosan G.

414. Conditioning Cottonseed. By L. Volkobrun. (*Masloboino-Zhirovaia Promshlennost*, No. 5/6, 1940. In Russian. From *Cott. Lit.*, April, 1942, p. 141.) Conditioned cottonseed yields better and more uniform oil than seed varying widely in moisture content. A method is described for humidifying seed to 10 to 11 per cent. moisture content. Moisture distribution measurements show considerable fluctuation, with 9 to 32 per cent. of total moisture contained in the hulls and 68 to 91 per cent. in the seed itself.

415. Estimation of Gossypol in Crude Cottonseed Oil. By J. O. Halverson and F. H. Smith. (*Indus. and Eng. Chem., Analyt. Ed.*, **13**, 1, 1941, p. 46. From *Exp. Sta. Rec.*, **86**, 6, 1942, p. 734.) Precipitation as dianilinogossypol dipyridine is expedited by increased temperature, by the addition of gossypol in an ether-extracted oil prepared from cottonseed meats, and by constant agitation, which precipitates the gossypol in a good crystalline condition for rapid filtration and washing without appreciable loss due to dissolving. Solubility is prevented by the use of pyridine in the wash solution. The gossypol compound is prevented from adhering to the glass container by the elimination of practically all water. Recovery of added gossypol and the reproducibility of results are good.

PESTS, DISEASES AND INJURIES, AND THEIR CONTROL.

416. Resistance of Plants to Insect Attack. By R. O. Snelling. (*Bot. Rev.*, 7, 1941, p. 543. From *Pl. Bre. Abs.*, xii., 2, 1942, p. 122.) This appears to be a very comprehensive review. There are 567 references in the bibliography. The word " resistance " is used in its widest sense and includes those characteristics which enable a plant to avoid, tolerate or recover from the attacks of insects under conditions that would cause greater injury to other plants of the same species. The review is divided into four parts—introduction, records and importance of host resistance, plant characteristics suggested as having an influence in resisting insect attack, and breeding plants to reduce insect damage. There are three tables—records of insect resistance, plant characteristics suggested as having an influence in resisting insect attack, and records of accomplishments in breeding plants for insect resistance.

417. The Economic Value and Biological Significance of Insect Resistance in Plants. By R. H. Painter. (*J. Econ. Ent.*, 34, 1941, p. 358. From *Pl. Bre. Abs.*, xii., 2, 1942, p. 122.) In this general review the following topics are discussed: resistant varieties as a principal control method; as an adjunct to other methods; in relation to the general population level of the insect involved; in relation to insect hyperparasitism; and in relation to chemical control. The interrelations of factors affecting insect resistance in plants are considered in terms of the three characteristics—preference, antibiosis (adverse effect on the biology of the insect), and tolerance. Finally, the problem of permanence of resistance and the evolutionary importance of insect resistance are considered.

418. Insects and the Spread of Plant Diseases. By W. Carter. (*Rpt. Smithson. Instn.*, 1940, p. 329. Washington, D.C., 1941. From *Rev. App. Ent.*, xxx., Ser. A, 1942, p. 386.) The author discusses the ways in which insects spread plant diseases by carrying on or in their bodies the spores of fungi and bacteria, with which they contaminate blossoms or wounds of the plant, by injecting injurious fluids into the plants in the course of feeding, or by transmitting viruses from diseased to healthy plants, and the effect of climate on these activities. He points out that the occurrence of insect-transmitted diseases of plants is world-wide, and gives a brief account of some of the control measures now in use and the probable lines of development in this field in the future.

419. Studies of Insect Damage to Cotton with reference to Soil-Conservation Practices. By P. A. Glick and K. P. Ewing. (*J. Econ. Ent.*, 34, 6, p. 737. Wisconsin, 1941. From *Rev. App. Ent.*, xxx., Ser. A, 9, 1942, p. 428.) An account of studies being made to determine the effect of the latest farming and soil-conservation practices in the Blacklands of Texas on insects injurious to cotton. The plan of operation, the records made, the scope of the insect studies and methods of making population counts of the different insects are described. Detailed seasonal infestation records are being made of cutworms, cotton aphid, thrips, cotton flea hopper, boll weevil, bollworm, cotton leafworm, fall armyworm, and Pentatomids, together with records of unusual outbreaks of other cotton pests. The survey has been in operation for only 2 years, and no trends are so far evident; it is anticipated that the work will not be completed for at least 9 or 10 years.

420. Resultados de la Experimentacion de Tratamientos contra las Plagas Animales del Algodonero. By H. Muñoz Pinochet and S. Tessi Seitún. (*Bol. Mens.* No. 75, *Junta Nac. del Algodon.* Buenos Aires, 1941, p. 580. From *Rev. App. Ent.*, xxx., Ser. A, 6, 1942, p. 314.) This is a review of the results obtained in experiments in 1939-40 in the Chaco Territory of Argentina on the

use of sprays and dusts against pests of cotton. Highly satisfactory control of the larvæ of *Alabama argillacea* Hb., without any injury to the plants, was given by "Larval" (an official insecticide containing 40 per cent. arsenic trioxide and 22 per cent. sodium hydroxide) applied at a concentration of 0·15 per cent. with the addition of 5 per cent. prickly-pear mucilage, and at the rate of 22 gals. per acre. The mucilage is prepared by macerating 30 lb. finely chopped pads of *Opuntia tuna* in 10 gals. water for 24 hours and straining. The spray should be made up on the day of application, and the amounts stated should not be exceeded or scorching may occur. The mucilage can be replaced by other adhesives, such as 5 per cent. molasses. Good results were also given by sprays of Paris green, calcium arsenate and lead arsenate, but no minimum dosages were worked out. Of the dusts tested against *A. argillacea*, Paris green at the rate of 1 kg. per hectare (about 0·9 lb. per acre) in an inert carrier and undiluted calcium arsenate at 5 kg. were both effective in 36 hours, but this period is too long under local conditions, since rains are frequent. It was reduced to 10 and 7 hours by increasing the amount of Paris green per hectare to 1·125 and 1·5 kg. respectively, and to 10 hours by applying a mixture of calcium arsenate and Paris green (9 : 1) at 4-5 kg. Lead arsenate was less economical. None of the dusts caused any injury to the plants. Arsenical sprays and dusts were effective but slow in action against the larvæ of the Noctuid, *Thyreion gelotopœon* Dyar, and the mixture of calcium arsenate and Paris green proved effective against the weevil, *Chalcodermus niger* Hust., when applied at the rate of 5 kg. per hectare. Good control of *Aphis gossypii* Glov. was given by a dust of nicotine sulphate containing 7½ per cent. nicotine and applied at the rate of 6·5 kg. per hectare, and it was cheaper than a spray of nicotine sulphate and soap. Sprays of nicotine sulphate and fish-oil soap were effective against the Tingid, *Gargaphia torresi* Costa Lima, but too costly except on a small scale. Dust insecticides were, in general, preferable to sprays for the control of sucking insects. Finely powdered slaked lime is an excellent carrier for arsenicals in dusts, which should be applied when the leaves are wet with dew.

421. Bengal: Annual Report of the Economic Botanist, 1939-40. (*Rpt. Dpt. Agr. Bengal*, 1939-40, Pt. II. Alipore, 1941. From *Rev. App. Ent.*, xxx., Ser. A, 3, 1942, p. 104.) Cotton was attacked by *Sphenoptera gossypii* and *Sylepta derogata* during the season, and in one district ratoon cotton was severely infested by *Cerococcus hibisci* Green.

422. Nyasaland: Plan of Research on Insect Pest Control. By E. O. Pearson. (*Nyasaland Agr. Qrtrly. Jour.*, January, 1942, p. 27.) A clear and concise exposition of the lines on which the study of cotton pests is being carried out with a view to the speediest possible reduction of the damage due to such cotton pests and diseases in the Lower River areas.

423. United States: Report of the Chief of the Bureau of Entomology and Plant Quarantine. By L. A. Strong and A. S. Hoyt. (*U.S. Dpt. Agr., Bur. Ent. and Pl. Quar. Rpt.*, 1941. From *Exp. Sta. Rec.*, **87**, 1, 1942, p. 87.) The work in connection with cotton insects included biology and control of the bollweevil, cotton flea hopper, leaf and root aphids, hemipterous insects (*Lygus, Chlorochroa* and *Euschistus* spp., etc.), bollworm, pink bollworm, particle size of insecticides for cotton insects, and *Thurberia* weevil control.

424. Cotton Insects of the United States. By V. A. Little and D. F. Martin. (Burgess Pubg. Co., Minneapolis, Minn. Price: $2.25; post free for payment in advance. From *Rev. App. Ent.*, Ser. A, **30**, 7, 1942, p. 363.) The authors have summarized the results of the large amount of work done by entomologists on the insects that attack cotton in the United States. The subjects dealt with are

mainly their bionomics and control, but information is included on distribution, alternate food-plants and the morphology of the various stages. The first section deals with insects that feed on the squares, flowers and bolls, and the second with those that attack the leaves, stems and roots. About half of the first section is devoted to *Platyedra gossypiella* Saund., *Heliothis armigera* Hb., and *Anthonomus grandis* Boh.

425. California: Cotton Insects. By G. L. Smith. (*California Sta. Bull.* 660, 1942. From *Exp. Sta. Rec.*, **87**, 1, 1942, p. 91.) Contains biological and control information on 28 insects deemed important in California, 6 of little or no importance, and 6 beneficial insects commonly found on cotton in the San Joaquin Valley.

426. Georgia: Cotton Insect Investigations. (*Ga. Coastal Pl. Sta. Bull.* 31, 1940. From *Exp. Sta. Rec.*, **86**, 2, 1942, p. 216.) A progress report mentioning studies on bollweevil, bollworms and aphids and their control on Upland and Sea Island cotton.

427. Studies of Western Aphids. By G. F. Knowlton. (*Utah Acad. Sci. Art and Letters, Proc.*, 18, 1940-41. From *Exp. Sta. Rec.*, **86**, 6, 1942, p. 809.) An annotated list of aphidæ of western United States, which includes host plant range and distribution.

428. Food-Plant Catalogue of the Aphids of the World, Including the Phylloxeridæ. By E. M. Patch. (*Bull.* 393 of the Maine Agr. Exp. Sta., Orono, Maine, U.S.A., 1938.) This catalogue is a compilation from aphid literature up to and including 1935. The contents of the volume are as follows: Prefatory Note, Acknowledgments, Food-plant Catalogue, Aphids for which Food Plants are not recorded in the Catalogue, Bibliography, Index to Plant Families, Index to Aphids.

429. Cotton Aphid Multiplication following Treatment with Calcium Arsenate. By E. W. Dunnam and J. C. Clark. (*J. Econ. Ent.*, **34**, 4, 1941, p. 587. From *Rev. App. Ent.*, xxx., Ser. A, 5, 1942, p. 264.) The results of preliminary studies on the factors that cause the increase of *Aphis gossypii* Glov. on cotton after dusting with calcium arsenate, carried out in Mississippi in 1938, when the numbers of parasites and predators present were insignificant, indicated that some of the insecticide was taken up by the leaves and some by the root system. The *p*H of the soil, and probably also that of the leaf cell sap, was increased in the plots of cotton dusted with calcium arsenate, and earlier maturity of the plants and shedding of leaves were associated with the increase. It was considered that the arsenic stimulated aphid reproduction and caused the shorter pre-reproductive period, the greater number of young born daily and the larger total number of young per aphid observed on the dusted plants. Further work showed that the *p*H of the cell sap in the leaves was consistently higher in plants dusted with calcium arsenate than in the control plants; that aphids multiplied more rapidly when caged on cotton leaves dusted with calcium arsenate containing 0·7 per cent. water-soluble arsenic pentoxide, as determined by the New York method, than when caged on untreated leaves, and even more rapidly on leaves dusted with calcium arsenate containing 13·9 per cent. water-soluble arsenic pentoxide. On cotton dusted with hydrated lime, aphids reproduced slightly faster than on the control plants, indicating that, though the amount of water-soluble arsenic was the most important factor, the hydrated lime in the calcium arsenate also contributed to the increase in aphids. In 1939, cotton plants were sprayed and dusted with a number of substances with different *p*H values (from 2·16 to 11·8) in an effort to find a material that could be used with commercial calcium arsenate to act as a buffer for the water-soluble arsenic pentoxide, reduce the alkalinity and permit the cotton plant to overcome any

possible injury caused by the remaining water-soluble arsenic pentoxide. The aphid population was relatively low in all plots, but plants dusted with zinc arsenate, with a pH of 6·4, had fewer aphids, appeared in better condition at the end of the summer, and produced higher yields than those treated with the other materials. It is considered, therefore, that zinc salts would probably be the most suitable materials for use with calcium arsenate for the control of cotton pests.

430. Control of the Cotton Aphid and Boll Weevil in 1940. By R. L. McGarr. (*J. Econ. Ent.*, **34**, 4, 1941, p. 580. From *Exp. Sta. Rec.*, **86**, 1, 1942, p. 68.) Calcium arsenate and mixtures of calcium arsenate and sulphur for boll-weevil control caused significant increase in cotton aphid populations in 1940. The addition of derris to these materials effectively controlled the aphids and held the populations at nearly the same level as the checks. Calcium arsenate and calcium arsenate-sulphur mixtures with derris gave good control of boll weevil.

431. Combinations of Insecticides for Control of Boll Weevil and Cotton Leaf Aphid. By C. F. Rainwater and F. F. Bondy. (*J. Econ. Ent.*, **34**, 1941, 2, p. 297. From *Exp. Sta. Rec.*, **85**, 4, 1941, p. 504.) In comparative tests conducted near Florence, South Carolina, in 1939, in which several insecticides and combinations of insecticides were employed in the control of the cotton boll weevil and cotton leaf aphid "calcium arsenate, mixtures of equal parts of calcium arsenate and two fixed-nicotine dusts, and barium fluosilicate plus derris (to give a rotenone content of 0·5 per cent.) were significantly better than two of the three cryolites tested with or without the addition of derris for boll-weevil control, when based on average seasonal infestation. Yield records and boll counts did not show significant differences between treatments. The cryolites and barium fluosilicate with derris were inferior to calcium arsenate in dusting qualities but were followed by aphid populations of only 12 to 24 per cent. of those with calcium arsenate. Equal parts of calcium arsenate and fixed-nicotine dusts held the aphid population to approximately 50 per cent. of that in the undiluted calcium arsenate treatments. Equal parts of calcium arsenate and sulphur, or of calcium arsenate and diatomaceous earth, with the addition of derris gave satisfactory boll-weevil control and kept the aphid population equal to or below that of the checks."

432. Topping Cotton in Early Fall as a Possible Means of Reducing the Spring Boll Weevil Population in the North-Western Part of the Florida Sea Island Cotton Belt. By P. W. Calhoun. (*Florida Ent.*, **24**, 2, 1941, p. 35. From *Rev. App. Ent.*, xxx., Ser. A, 6, 1942, p. 288.) The investigations described were carried out in view of the exceptionally large numbers of boll weevils (*Anthonomus grandis* Boh.) that develop in autumn in cotton bolls in the upper parts of the plants in the north-western part of the Florida Sea Island cotton belt. These populations commonly exceed 10,000 weevils per acre, and control is so difficult that the growing of Sea Island cotton on a large scale generally has to be abandoned. An experiment was made in the autumn of 1940 over some 200 acres of heavily infested cotton; most of the fields had produced less than half their crop. Almost all the bolls on the upper half of the plants contained 2-5 larvæ or pupæ, while the tops were producing an abundance of squares. The plants were topped on September 10, about 10 days before the final picking; the upper parts (about one-third of each plant) that contained bolls severely infested with advanced-stage larvæ or pupæ were cut off, in order to destroy as much of the squaring portion as possible without discarding any sound bolls. As soon as the discarded tops died, the adult weevils feeding on them moved back to the plants, and fed on the few remaining squares and on bolls that were not ready to open. As the population had already been high

for several weeks, nearly all the sound bolls were tough, fibrous and almost ready to open. About two weeks after topping, the adult weevils began to decrease in numbers until only a few remained. Whether most of them died or migrated is not known. The immature stages died in great numbers in the young bolls on the removed tops, and the percentage emergence was much lower than it would have been had the tops remained on the plants. The bolls on the living plants that had been attacked, but not completely ruined, by the weevils apparently opened more quickly and fully as a result of topping, which seemed to result in less waste cotton being left in the field at the final picking. It is thought that the cost of the operation was more than covered by the increase in the amount of the cotton harvested. Data are reviewed from the literature indicating that an abundance of squares and blossoms in autumn increases the weevils' chance of surviving the winter, and original observations are recorded which showed that newly emerged weevils fed on young cotton leaves, mature green leaves, or squares all gained equally in weight, but that those fed on squares did so more rapidly; it was considered that the weevils that fed on leaves could not have oviposited normally. When adults taken in the field were given moisture but not food, very few survived for more than a few days after losing 20 per cent. of their weight; the loss of weight was generally slow and regular until two or three days before death, when it became irregular and rapid. If an abundance of squares in autumn helps the weevil to survive the winter, the scarcity of squares in the fields that have been topped will decrease the percentage survival of the relatively few weevils that remain, and so increase the effect of the reduction in the population caused by the topping. If practised co-operatively on a sufficiently extensive scale, topping should thus prevent the occurrence of the heavy spring populations that are common in the north-western part of the Florida Sea Island cotton belt. It is not recommended for the central and southern parts of this belt, however, as the same result can be better obtained there by early picking followed by prompt destruction of the stalks.

433. Texas: Insect Damage, 1942. (*Cotton*, M/c, 18/7/42, p. 6.) Reports from Texas Agricultural Experiment Station indicate that boll weevils are injuring about a third of the older squares, with greater damage occurring in parts of south and central Texas. During the week ended June 27 no flea hopper damage was reported outside of river bottom fields, and in general it appears that this year flea hoppers will be of minor importance only. Thrips have delayed the development of early planted cotton in North Texas.

434. The Alternate Host Plants and Associated Parasites of *Pempheres affinis* Faust in South India. By P. N. Krishna Ayyar. (*Ind. J. Ent.*, **2**, 2, 1940, p. 213. From *Rev. App. Ent.*, xxx., Ser. A, 10, 1941, p. 521.) An account of investigations begun in 1937 on the alternative food-plants of the cotton stem weevil, *Pempherulus* (*Pempheres*) *affinis* Faust, in Madras and the parasites of it that are associated with them. The weevil was observed breeding on 17 species of wild and cultivated plants, in addition to cotton, mainly belonging to the Malvaceæ and Tiliaceæ.

435. The Biology and Distribution of the Parasites of the Cotton Stem Weevil, *Pempheres affinis* Fst., in South India. By P. N. Krishna Ayyar. (*Proc. Ind. Acad. Sci.*, **14**, 5, 1941, p. 437. From *Rev. App. Ent.*, xxx., Ser. A, 6, 1942, p. 301.) A list is given of 15 Hymenoptera that parasitize the larvæ of *Pempherulus* (*Pempheres*) *affinis* Faust on cotton and other plants in South India, together with descriptions of all stages and information on the life-history, frequency, distribution, alternate hosts and natural enemies of most of them. It is concluded that the percentage of natural parasitism in cotton fields is too

low to afford adequate control, but that it might be improved by artificial multiplication and liberation of at least *Spathius critolaus* Nixon.

436. BIOLOGICAL CONTROL OF THE COTTON STEM WEEVIL, *Pempherulus affinis* FST., IN SOUTH INDIA. By P. N. Krishna Ayyar. (*Ind. J. Agr. Sci.*, xii., 1, 1942, p. 58.) The subject is dealt with under three main heads: I. *Studies on the weevil :* Distribution, seasonal history. II. *Studies on the parasites :* Parasites in association with cotton; Parasites in association with alternate host plants; Mass breeding, experimental releases, and recoveries. III. *Present position of the problem, and conclusions.* Much of the information contained in the paper has already been abstracted from other sources.

[*Cf.* Abstrs. **167, 168, 420,** Vol. XVIII., and **167, 434, 435,** Vol. XIX. of this Review.]

437. EFFECT OF TEMPERATURE AND HUMIDITY ON THE DEVELOPMENT OF THE EGGS AND LARVÆ OF THE BOLL WORM. By I. A. Rubtzov. (*Bull. Pl. Prot.*, 1, p. 9, Leningrad, 1941. In Russian. From *Rev. App. Ent.*, xxx., Ser. A, 8, 1942, p. 374.) The following is based on the author's summary of laboratory investigations in 1937 on the effect of temperature and humidity on *Heliothis armigera* Hb. They were made in Leningrad on the offspring of moths from pupæ collected in cotton fields in Azerbaijan. The lowest and highest temperatures at which development occurred were found to be about 14° C. (57·2° F.) and 37-38° C. (98·6-100·4° F.) for the eggs, 14-16° C. (57·2-60·8° F.) and 35-36° C. (95-96·8° F.) for the larvæ, and 11-14° C. (51·8-57·2° F.) and 34° C. (93·2° F.) for the pupæ. The duration of development depended largely on temperature and the type of food offered. Thus, larvæ that fed on tomatoes and maize developed more slowly than those given leaves of *Chenopodium album* and *Senecio vulgaris.* The eggs were resistant to a wide range of temperature and humidity, and the larvæ fairly so, the optimum for the latter being 27-28° C. (80·6-82·4° F.) and 100 per cent. relative humidity for the early instars and 25-26° C. (77-78·8° F.) and 80-90 per cent. for the later ones. The pupæ were sensitive to variations in humidity and were not very resistant to cold. The chief cause of larval mortality at various combinations of temperature and humidity was found to be sameness of food; for satisfactory development, a change of food is essential, especially for the older instars, which need seeds. If the threshold of development is assumed to be 10° C. (50° F.) the sum of effective temperatures necessary for the development of a generation is about 700 day-degrees C. (1,260 F.), so that in the areas in which the moth is a pest of cotton four to six generations could be produced during a season. In the part of Russia adjoining the Baltic, however, the moth is rare, although the temperature in certain districts would in theory permit the development of two complete generations a year.

438. THE RELATION OF MOISTURE CONTENT OF THE COTTON PLANT TO OVIPOSITION BY *Heliothis armigera* HBN. AND TO SURVIVAL OF YOUNG LARVÆ. By R. K. Fletcher. (*J. Econ. Ent.*, **34**, 6, 1941, p. 856. From *Exp. Sta. Rec.*, **86**, 5, 1942, p. 660.) An examination of the data obtained during the years 1935-39 showed that the correlation between the average percentage of moisture in the entire cotton plant and number of eggs per 100 plants was not significant. The correlation between oviposition and the percentage of water occurring in the growing tips only was found to be not significant in 1938 but was significant in 1939. In 1939 a highly significant correlation was found between the number of larvæ at each point and the percentage of moisture in the growing tips based on the weight of water in the entire plant. This highly significant correlation occurs even though it has often been found that a high percentage of the first-instar larvæ is destroyed by predators.

439. NUMBERS OF *Heliothis armigera* HBN. AND TWO OTHER MOTHS CAPTURED AT LIGHT TRAPS. By C. H. Martin and J. S. Houser. (*J. Econ. Ent.*, **34**, 4, 1941, p. 555. From *Rev. App. Ent.*, xxx., Ser. A, 5, 1942, p. 260.) The results are given of experiments carried out in 1938 and 1939 in Ohio to compare the attractiveness to adults of *Heliothis armigera* Hb. of electric lights including incandescent, mercury vapour and fluorescent lamps, that ranged over a wide scale of brilliance and differed in spectral distribution; records for *Cirphis unipuncta* Haw. and *Protoparce sexta* Joh., obtained in 1939, are included. There were many nights on which *H. armigera* did not come to the light traps, even when it was present in the field, and there was no sharp difference in response to the various lights; many individuals flew straight into the lights, but others rested on neighbouring plants and sometimes oviposited before completing their flight. In 1938, when traps containing five different lamps were operated in tomato fields, 100-watt mercury vapour lamps, with a brightness of 3,400 lumens, attracted three or four times as many moths as a 15-watt fluorescent lamp or a 150-watt incandescent lamp (270 and 2,610 lumens, respectively), though daily records showed that on several nights the number of moths caught at the fluorescent light equalled or exceeded the number caught at the mercury vapour light. In 1939, when 10 lamps were compared in traps in fields of tomato and sweet maize, a 1,000-watt mercury vapour lamp with an intensity of 65,000 lumens did not appear to be any more attractive than a blue fluorescent lamp giving 2,300 lumens or a 100-watt mercury vapour lamp giving 3,400 lumens, but it was the most attractive to *P. sexta*. The 1,000-watt mercury vapour light attracted more insects in general than the 100-watt mercury vapour light or a cluster of five 20-watt blue fluorescent lamps.

440. HIBERNATION OF THE CORN EARWORM (*Heliothis armigera*) IN SOUTH-EASTERN GEORGIA. By G. W. Barber. (*U.S. Dpt. Agr., Tech. Bull.* 791, 1941. From *Exp. Sta. Rec.*, **86**, 3, 1942, p. 359.) Corn earworm hibernation was studied during the years 1930-33 in Chatham County. An average of 51 per cent. (range 30-80 per cent.) of the individuals that entered soil in cages to pupate during the fall survived the following spring. Larvæ dug pupal burrows from less than 1 in. to more than 10 in. deep. Three types of emergence were noted—immediate, delayed within the current year, and delayed until the following year. Moths emerged from May 1 to July 23 in 1931, from April 2 to June 27 in 1932, and from April 18 to July 27 in 1933. The variation in depth to which larvæ burrow apparently enables the earworm to survive disasters that might befall the active stages above ground, since resting pupæ were continuously present in the soil and moths emerged throughout the growing season. As few of the larvæ that mature in early corn hibernate, it is concluded that if all field corn of an area could be planted early and be followed by crops that are not attractive as food plants for earworms, overwintering populations would be reduced, and a lowering of the level of population of the insect might result.

441. THE RESULTS OF THE USE OF THE *Trichogramma* OF THE AZERBAIJAN RACE AS A CONTROL MEASURE AGAINST THE AMERICAN COTTON BOLLWORM ON COTTON PLANTS IN THE AZERBAIJAN, U.S.S.R. By I. N. Goretzkaya. (In Russian.) (*Bull. Pl. Prot.*, 1-2, 1940, p. 166. From *Rev. App. Ent.*, xxx., Ser. A, 3, 1942, p. 146.) The Azerbaijan race of *Trichogramma evanescens* Westw. was first reared in 1936 from eggs of the Noctuid, *Apopestes spectrum* Esp., collected near Kirovabad, and in field experiments carried out there in 1936-38, in which large numbers of parasites were liberated against eggs of *Heliothis armigera* Hb. (*Chloridea obsoleta* F.) on cotton, it proved more effective than the Azov-Black Sea race and the Central Asiatic form (subsequently described as *T. turkestanica* Meier). It was found that in the climate of Kirovabad, which is intermediate

between the dry subtropical and temperate climate, development of the Azerbaijan race continued throughout the summer, provided that eggs of *H. armigera* were sufficiently numerous. None of the three forms, however, survived even for a season in the Mugan steppe, where the climate is of the dry subtropical type with sharp fluctuations in temperature and humidity. The natural increase of the Azerbaijan race near Kirovabad is restricted by unfavourable weather in autumn and winter, and the lack of sufficient numbers of winter hosts. Observations in 1937-38 showed that the percentage parasitism of eggs of *A. spectrum* in May did not exceed 5, while that of eggs of *Pieris rapæ* L., *H.* (*C.*) *dipsacea* L., and *Plusia* (*Phytometra*) *gamma* L., in April was less than 1; no parasitism was found in eggs of *Pieris brassicæ* or *Tortrix* (*Cacœcia*) *strigana* Hb. The eggs of *H. armigera* on various crops were parasitized from mid-July to the end of August. It has been shown that the optimum temperature for these three forms is 25-27° C. (77-80·6° F.) and the optimum percentage relative humidity 64-66 for the Azerbaijan race, 70-75 for the Azov-Black Sea race, and 73-75 for *T. turkestanica*. Observations carried out in June-September, 1938, on the development of the three forms in the field after the release of adults on sample plants artificially infested with eggs of *H. armigera* or *Sitotroga cerealella* Ol. showed that the percentage of females in the following generation was considerably reduced when climatic conditions differed from the optimum. The percentage parasitism by the Azerbaijan race ranged from 16 to 62 and was also reduced when either temperature or humidity deviated from the optimum. The adult parasites did not spread by unaided flight for more than about 30 ft. from the point of release, but covered a distance of 100 ft. in the direction of a wind with a velocity of not more than 6·7 miles per hour. When the Azerbaijan race was released in cotton fields at the rate of a total of 200,000 per acre, the most satisfactory method was to liberate 5 batches of about 40,000 each at intervals of 3 days. Under these conditions, the percentage parasitism of *H. armigera* was maintained at an approximately even level of 40-48 throughout the period of application. When 3 batches of about 166,000 were released at intervals of 5 days, parasitism was high during the first 3 days after each release, but then decreased sharply. If applied against each generation of the moth and begun as soon as the first eggs appear, the 3-day system of release should reduce the numbers of larvæ of *H. armigera* by 45 per cent. or more. The parasites should be liberated in the evening at 40 separate points per acre, to secure an even distribution. Releasing them against *H. armigera* on *Hibiscus esculentus*, which is frequently grown as a trap crop for the moth in Azerbaijan, was ineffective, since the spines and sticky exudation on the capsules killed the adult parasites before they could reach the eggs of the moth. The percentage parasitism did not exceed 18·2.

442. SOME OBSERVATIONS ON JASSID AT THE KENYA COAST. By E. W. Gaddum. (*Emp. J. Exp. Agr.*, July, 1942, p. 133.) The technique employed for jassid counts is explained. Some records of jassid populations in 1938-40 are given; the figures show the comparative severity and duration of the infestation for each of the seasons under review. Significant differences between cotton varieties in their attractiveness to jassid were found in each season. A graph showing the difference in jassid population between the most attractive and the least attractive variety in the 1940 counts illustrates the range of variation between varieties, and shows that the differences are well marked throughout the period of infestation. Cotton interplanted with maize supported fewer jassid than cotton planted in a pure stand. By comparing jassid populations on the windward sides of double rows of cotton with the populations on the leeward sides, it was found that jassid was more numerous on the exposed sides. Planting of strips of maize as a windbreak reduced the jassid population of the protected cotton to less

than half that of the control. A field count designed to show the manner in which jassid causes losses in yield indicated that jassid has apparently no effect on flower-production or boll-shedding. It did appear to be associated with an increase in the number of shrivelled bolls on the plant and a corresponding decrease in healthy buds, flowers, and bolls. The drum experiment in 1939 (in which cotton was planted in oil drums, thirty plants to each drum) confirmed the 1938 observations that jassid had no effect on flower-production and boll-shedding. In this experiment, however, jassid also had no effect on the number of shrivelled bolls on the plant or on the yield. In the 1939 drum experiment jassid was associated with a large amount of staining and the appearance of *Diplodia gossypina* in the crop. A cage experiment in 1940 did not support the view that this association was any more than a chance one. During the period 1938-40 no association could be found between varietal attractiveness to jassid and yield. Similarly, reduction of jassid population by wind protection has not so far produced any evidence of increased yield. Field observations over a number of years confirm the view that severe jassid attack is not always associated with low yields. It is concluded that the main cause of the heavy crop losses in 1938 and 1939 was due to some cause other than jassid.

443. Guerra al Gusano Rosado de Algodon. By G. N. Wolcott. (*Agr. Exp.* [*Puerto Rico Univ. Sta.*], **1**, 5, 1941. From *Exp. Sta. Rec.*, **86**, 5, 1942, p. 660.) A practical account of the fight against the pink bollworm.

444. Proyecto de Instalacion de un Insectario y sus Funciones. By R. G. Mallo. (*Bol. Mens. Junta Nac. del Algodon*, No. 76. Buenos Aires, 1941, p. 660.) Pink bollworm is a major pest of cotton in the Argentine Republic, and the factors contributing to its spread are briefly discussed. It is proposed to establish an insectarium near the Cotton Experiment Station in the Roque Saenz Pena Presidency for the study of pink bollworm and the breeding of parasites for its control. The most effective parasites appear to be *Chelonus blackburni* and *Microbracon mellitor*.

445. Secondary Hosts of the Pink Bollworm in the Lower Rio Grande Valley of Texas and Mexico. By F. F. Bibby and I. Moreno. (*J. Econ. Ent.*, **34**, 6, 1941, p. 736. From *Exp. Sta. Rec.*, **86**, 5, 1942, p. 660.) The secondary hosts of the pink bollworm in this area are: okra, which ranks second to cotton in importance; *Malvaviscus drummondii*, found in the Lower Rio Grande Valley, part of Florida, Gulf Coast between Florida and Texas, and the Atlantic Coast between Florida and Pamlico Sound, N.C., which is occasionally infested; *Pseudobutilon lozani*, a mallow found in nine counties of Texas and in Mexico, from which two pink bollworm moths emerged.

446. Fatal Temperatures for the Pink Bollworm (*Platyedra gossypiella* Saund.) of Cotton. By H. S. Pruthi and T. Ahmad. (*Ind. J. Agr. Sci.*, xi., 6, 1941, p. 906.) An account of investigations carried out in 1940 at the Imperial Agricultural Research Institute, New Delhi. The results have shown that complete mortality is effected when naked larvæ are exposed for 24 hours to 45° C., 1-2½ hours to 50° C., 7-10 minutes to 55° C., 5 minutes to 65° C., or 1 minute to 70° C. If instead of naked larvæ the cotton seeds containing larvæ are treated, and are brought from and taken to a room temperature of 35-40° C. in a thin layer, an exposure of a little over 3 hours to 50° C., 40 minutes to 55° C., 15 minutes to 60° C., 7-10 minutes to 65° C., or 3-5 minutes to 70° C. is completely fatal to larvæ within the seeds. It may thus be concluded that from a practical point of view, where the time factor is of considerable importance in dealing with large quantities of material, the exposure of seeds to heat should be so regulated in reference to the initial and final seed temperature and the nature of the seed,

etc.) that the larvæ inside the seeds are at a temperature of 65-70° C. for 1-2 minutes. Concerning the part played by atmospheric moisture in determining larval mortality at different high temperatures, it is shown that under relatively dry conditions the larvæ resist high temperatures better, and, therefore, longer exposures would be required to ensure complete mortality. For instance, while an exposure of seed for 24 hours to 45° C. is completely fatal to larvæ if the saturation deficiency of air is 3-14 mm., it is not fatal if the saturation deficiency is 32 mm. Experiments on the protection afforded by the variety of cottonseed to the larvæ inside them, during heat treatments, were conducted only on two cottons—viz., a *desi* variety (Mollisoni) and an American variety (289F). The results showed a slightly higher mortality in the larvæ in the American seed. The viability of cottonseed is not affected materially up to an exposure of about 30 minutes to 65° C. or 20 minutes to 75° C. or 10 minutes to 80° C., and this shows that there is a fair margin of safety between heat exposures fatal to larvæ and those injurious to the viability of the seeds. It is pointed out that seeds after coming out of the hot machine retain heat for some time, particularly if they are put into sacks immediately after treatment, and this period must be kept in mind while prescribing temperature and exposure. Experiments have shown that heat takes a considerable time to penetrate through a layer of cottonseed. For instance, when seeds were transferred from a room temperature of about 36° C. to a chamber at 68° C., seeds less than half an inch below the surface took 7-8 minutes to reach within a degree of the chamber temperature. These experiments emphasized that during heat treatment seeds should be exposed in a very thin layer, they should be kept constantly stirred, and the chamber air above the seeds must also be kept in motion. Investigations on the effect of sun heat as a method of killing larvæ inside seeds indicated that an exposure of infested seed to sun for 9 hours during the hottest part of the year (May) may not be completely effective if the day, although otherwise clear, follows a shower of rain giving rise to cool breeze. On the other hand, under ideal conditions of heat transmission only half an hour's exposure of infested seed to the sun during a comparatively cool month of March may give cent. per cent. mortality of larvæ. It may be said, however, that the factors on which the success of sun heat as a control measure depends are so variable that every individual exposure must be followed by an actual test of mortality among larvæ inside the treated seed before the particular consignment can be said to have been effectively treated.

447. Preliminary Notes on the Parasites of the Spotted and the Pink Bollworms of Cotton in Coimbatore. By M. C. Cherian and M. S. Kylasam. (Coimbatore.) (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, p. 174.) The spotted bollworms *Earias fabia* and *E. insulana* that infest the cotton buds and bolls are subject to field parasitization by five parasites—*i.e.*, *Microbracon lefroyi* D. and G., *Rhogas aligharensi* Quadri, *Bassus* n.sp., *Elasmus johnstoni* and *Actia hyalinata*. The caterpillars of *Platyedra gossypiella* infesting cotton buds and bolls are attacked in nature by the following parasites: *Goniozus* n.sp., *Apanteles pectinophoræ* and *Microbracon gelechidiphagus*. This bethylid is of the blossom-infesting type; hence a very high parasitization of the pink bollworms infesting flowers is recorded. As high as 49 per cent. of the worms were found attacked in July. It is known to parasitize other hosts like the caterpillars of *Antigastra* and *Adisura*.

448. Control of the Common Red Spider on Cotton. By D. Isely. (*J. Econ. Ent.*, **34**, 2, 1941, p. 323. From *Rev. App. Ent.*, xxx., Ser. A, 3, 1942, p. 133.) An account is given of field tests with sulphur alone or mixed with 5 per cent. of a commercial dust containing 1 per cent. dinitro-ortho-cyclohexylphenol in

walnut-shell flour against *Tetranychus telarius* L., on cotton, carried out during an extensive outbreak that occurred in north-eastern Arkansas in the summer of 1940. The dusts were applied between July 28 and August 7, when infestation was spreading. Since most infestations originated from woodland or banks adjacent to the cotton and a few from vegetation round stumps, the total area to be dusted was not great, and small dusters were used. Infestation was spread by cultivation and sometimes by the operation of dusting, and appeared to be more extensive where the plants were rank and had interlacing branches. The percentages of previously infested leaves on which active mites were present within a week after dusting were 26·67 following the mixture and 84·57 following sulphur; mites occurred on 98·83 per cent. of the injured leaves in the controls. There were very few mites per leaf in the first case and relatively few, compared with the control, in the second. Single applications of either dust checked the spread of the mite, though three were necessary to eradicate it in a few places; eradication followed more readily where the mixture was used. No plant injury was caused by the dinitro-o-cyclohexylphenol at the concentration tested (1·05 per cent.). On other plantations on which sulphur was applied, the results were variable and the degree of control appeared to be proportional to the thoroughness of the application. Dusting from above had little value, particularly on rank cotton; it was necessary that the infested foliage should be covered with the dust.

449. THE SAND WIREWORM. By J. N. Tenhet. (*U.S. Dpt. Leafl.* 212, 1941. From *Cott. Lit.*, April, 1942, p. 121.) The sand wireworm (*Horistonotus uhlerii* Horn) is a serious pest of cotton, corn, and other crops in certain areas of the coastal plain of South Carolina, and also, at times, in various other cotton states. Farm practices that will reduce losses from this pest are given.

450. LOS "MANCHADORES" DEL ALGODON EN VENEZUELA. By G. Vivas-Berthier. (*Bol. Soc. Venezol. Cienc. nat.*, 7, 48, 1941, p. 115. From *Rev. App Ent.*, xxx., Ser A, 6, 1942, p. 314.) In view of proposals to increase the cultivation of cotton in Venezuela, notes are given on the types of injury caused to it by *Dysdercus* and measures for the control of these bugs. The species of this genus that have been observed there are *Dysdercus ruficollis* L., *D. pallidus* Blöte, *D. chiriquinus* Dist., *D. fernaldi* Ballou, *D. peruvianus* Guer., *D. obliquus* H.-S., and *D. mimus* Say. The last four have been taken in cotton, and the last two have not previously been recorded from Venezuela.

451. CONTROL OF THRIPS ON SEEDLING COTTON. By J. R. Eyer and J. T. Medler. (*J. Econ. Ent.*, **34**, 5, 1941, p. 726. From *Rev. App. Ent.*, xxx., Ser. A, 7, 1942, p. 358.) As a result of severe damage to seedling cotton in New Mexico in the spring of 1941 by a thrips identified as *Frankliniella occidentalis* Perg. sprays consisting of either 2 lb. tartar emetic, with 1 U.S. pint Dowax as a spreader, or 2 lb. of a proprietary sodium antimony lactophenolate, each with 5 lb. brown sugar in 50 U.S. gals. water, were tested during the first week in June. Counts made 1, 2 and about 7 days after treatment showed significant reductions in the numbers of thrips on the plants in all cases except the first count after the use of the proprietary compound. Examination a week after spraying showed a rapid recovery of treated plants.

452. THE PROBABILITY LAW IN COTTON SEEDLING DISEASE. By K. S. Chester. (*Phytopathology*, xxxi., 12, 1941, p. 1078. From *Rev. App. Mycol.*, xxi., 4, 1942, p. 196.) At the Oklahoma Agricultural Experiment Station a mathematical analysis was made of the survival of cotton seedlings in the greenhouse and field under varying conditions of infection by *Glomerella gossypii*, *Fusarium moniliforme* (*Gibberella fujikuroi*), *Rhizoctonia* (*Corticium*) *solani*, and other seed-infesting fungi, with a view to determining the extent to which an infected plant is

hazardous to those in the immediate vicinity. Given freedom from severe infection by *C. solani*, the mortality of seedlings from diseased seed followed a random distribution, agreeing with the formula derived by expansion of the binominal equation. The absence of a skew distribution, with an excessive number of seedling failures in hills containing one or more infected seeds, is taken to indicate that, *C. solani* being excluded, diseased seedlings do not ordinarily constitute a threat to the health of adjoining sound ones. This hypothesis was confirmed by direct observation of the success of healthy seedlings in the presence of diseased ones in soil free from *C. solani*, as well as by the equal emergence rates of seedlings from mixtures of infected and sound seed whether planted under conditions of many or few potential contacts between diseased and healthy seedlings. On the other hand, where *C. solani* was a factor, an unduly high proportion of seedling failures, attributable exclusively to this cause, was registered in hills originally containing one or more diseased seedlings. These data explain the greater utility of ceresan seed treatment in the south-eastern States, where *G. fujikuroi* and *Glomerella gossypii* are the principal agents of seedling disease, as compared with those of the south-west (Texas and Oklahoma), in which acid delinting is more successful against the predominant pathogen *C. solani*, by curtailing the period of susceptibility of the host. In this connexion the writer emphasizes the urgent need for further development of chemical protection of cotton and legume seed against *C. solani* in the south-west, volatilization over a relatively long period being the foremost requirement in a fungicide intended for such a purpose. The observation that the infection of a given seedling does not endanger the health of those surrounding it has a bearing on the planting value of partially infested seed, which may be regarded, other factors being equal, as proportional to the results of laboratory germination tests.

453. ISOLATION AND INFECTION TESTS WITH SEED- AND SOIL-BORNE COTTON PATHOGENS. By W. W. Ray and J. H. McLaughlin. (*Phytopathology*, xxxii., 3, 1942, p. 233. From *Rev. App. Mycol.*, xxi., 7, 1942, p. 331.) Particulars are given of a series of greenhouse tests conducted at the Oklahoma Agricultural Experiment Station to determine the relative pathogenicity of a number of seed- and soil-borne fungi to three cotton varieties—*viz.*, Acala (1938 Oklahoma crop), Paymaster (1939 Texas), and D. and P. L. 11A (1938 Mississippi), the organisms being inoculated into (*a*) sterile soil (2 parts loam and 1 each of sand and sewer sludge) in which sterile seed was subsequently planted, and (*b*) cotton seedlings grown under sterile conditions in test tubes on water agar. The data were collected at the end of 28 days in most of the trials. At an average temperature of 80° F. and with an ample water supply for the plants, the four most virulent pathogens were *Glomerella gossypii*, *Rhizoctonia* (*Corticium*) *solani*, *Fusarium scirpi*, and *F. moniliforme* (*Gibberella fujikuroi*) in the order named. In the excessively humid atmosphere induced by heavy and repeated watering (several times daily) at a temperature of 80°, all the organisms tested, especially *G. fujikuroi*, acquired an access of virulence, with the exception of *F. vasinfectum*. Conversely, a decline in pathogenicity was manifested by most of the fungi, excepting *Glomerella gossypii*, *C. solani* and *F. scirpi*, in soils kept only just moist enough to maintain the growth of the seedlings. Plants transferred to the open (65°) after several days at 80° were severely attacked by *C. solani* and *F. scirpi*, the other fungi causing no serious injury under these conditions. *G. gossypii* and *C. solani* were responsible for considerable damping-off in soils rendered alkaline (*p*H 8·3) by the addition of lime, and were also injurious in those with an acid reaction (6·3) due to the incorporation of sulphur. Since *G. gossypii* was shown to have the heaviest infection index (obtained by multiplying the percentage of severely diseased plants in each by three, moderately infected by two, and

slightly attacked by one, totalling, and averaging), it was given an arbitrary weighted index of 100, the proportions to which of the other fungi concerned were as follows: *C. solani* 86, *F. scirpi* (isolate D) and its var. *acuminatum* 58 and 56 respectively, *F. chlamydosporum* 53, *G. fujikuroi* (isolate 110) 52, *F. vasinfectum* (27) 48, *F. scirpi* (44A) 47, *F. solani* 46, *F. equiseti* var. *bullatum* 46, *Sclerotium bataticola* (41), [*Macrophomina phaseoli*] 45, *F. semitectum* 42, *G. fujikuroi* (115) 40, *F. vasinfectum* (24), 37, *G. fujikuroi* (18) 35, *F. vasinfectum* (27) 34, and *M. phaseoli* (R 37) 30. Of all these fungi *C. solani* is regarded as the most injurious to cotton seedlings in Oklahoma, where it is widely distributed in the soil and very difficult to control.

454. PLANT DISEASES IN TEXAS AND THEIR CONTROL. By A. A. Dunlap. (*Circ.* 91, *Texas Agr. Exp. Sta.*, 1941.) This 70-page circular gives brief descriptions and control measures for most of the common plant diseases affecting economic plants in Texas. The first part lists the various crops in alphabetical order and treats of the diseases most frequently found affecting these plants. The second part gives general information about certain diseases, such as cotton root rot, nematode root knot, crown gall, damping-off, chlorosis, etc., and the most recent measures of control. The third part of the circular deals with the methods and materials used in controlling plant diseases, and such topics as soil sterilization, seed treatment, fungicides, spreaders, and spraying and dusting equipment are discussed. Thirty photographs are included illustrating symptoms of certain diseases or results of some disease-control measures.

455. *Æcidium Gossypii*, THE ÆCIAL STAGE OF *Puccinia Boutelouæ*. By J. T. Presley. (*Phytopathology*, xxxii., 1, 1942, p. 97. From *Rev. App. Mycol.*, xxi., 5, 1942, p. 253.) Field observations in the late summer and autumn of 1940 in Arizona having indicated the possibility of a connexion between the uredo- and teleuto-spores of a rust tentatively determined as *Puccinia Boutelouæ* on the grasses *Bouteloua aristidoides* and *B. barbata* and the æcidia of *Æcidium Gossypii* on cotton, cross-inoculation experiments were carried out in the laboratory at the University of Minnesota in the following spring with positive results on Acala cotton, on the one hand, and four species of *Bouteloua* (the two above-mentioned, *B. curtipendula* and *B. gracilis*) on the other. A genetic connexion between the two stages may therefore be regarded as established. The question arises, however, whether *P. Boutelouæ* is identical with the morphologically very similar *P. vexans*, which are separated by Arthur on the basis of teleutospore pedicel length. The writer could find no justification for this distinction, and should further examination reveal the existence of only one species the name *P. vexans* would take priority over *P. Boutelouæ*.

456. WIND DISSEMINATION OF ANGULAR LEAFSPOT OF COTTON. By J. G. Brown. (*Phytopathology*, xxxii., 1, 1942, p. 81. From *Rev. App. Mycol.*, xxi., 5, 1942, p. 252.) In September, 1940, in Southern Arizona, a 240-acre field of the S × P cotton variety, susceptible to blackarm (*Bacterium malvacearum*), raised from sulphuric acid-delinted and ceresan-dusted seed, contracted extensive and uniform infection by the blackarm phase of angular leafspot, adjacent fields being proportionately less severely attacked. The most intensively infected field lay directly west of a half-section of land planted with untreated or "fuzzy" seed, and adjoined on the west, without barrier, a similarly planted 80-acre field. A field of cotton raised from treated seed, lying north of the above-mentioned half-section, contained more diseased plants on the side contiguous to the latter, while in a ranch to the south the only infected plants were situated on the side adjoining the half-section. Evidence was available to the effect that the cultivated cotton

in the untreated fields constituted the sole source of inoculum, which was apparently conveyed to the treated cotton by a dust storm on August 20, following injury to the plants by hail a week earlier. The heaviest infection reached the field on the west of the half-section raised from untreated seed, but the inoculum-bearing dust also spread laterally westwards in a fan-shaped belt in such a way as to involve bordering fields on the north and south, while at the same time infective material from the 80-acre field planted with untreated seed was also borne westwards. Cotton fields serving as controls, situated at a distance of 12 miles from the infested areas and subjected to similar conditions, apart from the hail and dust storms, remained free from blackarm.

B. malvacearum was isolated exclusively from untreated seed. The writer's studies were facilitated by absence from the crop of all seed-borne diseases other than blackarm, and the virtual freedom of the fields from *Verticillium* (*albo-atrum*) and Texas root rot (*Phymatotrichum omnivorum*). Part of the damage attributed by farmers to blackarm, however, was really due to the air-borne *Alternaria* species.

457. A Survey of Cotton Boll Rot Diseases and Associated Micro-organisms in 1941. By P. R. Miller and R. Weindling. (*Pl. Dis. Rptr.*, xxv., 20, 1941, p. 518. Mimeographed. From *Rev. App. Mycol.*, xxi., 4, 1942, p. 196.) As in the three preceding years of the cotton boll disease survey, *Glomerella gossypii* was again the predominant pathogen on material collected east of Texas and Oklahoma. On the other hand, the water-soaked spots commonly attributed to *Bacterium malvacearum* were less prevalent than heretofore, and the percentage of such lesions yielding the causal organism was much lower than in 1940—namely, 13 as compared with 41 per cent. Tables are given showing the frequency of occurrence of micro-organisms in sample lots of bolls and in cultures from individual bolls, expressed in terms of percentage in both cases.

[*Cf.* Abstrs. **306**, **752**, Vol. XVI., **175**, **433**, Vol. XVIII., and **177**, Vol. XIX. of this Review.]

458. Control of the Root-Knot Nematode by Cultural Practices. By J. C. LeRoux and F. J. Stofberg. (*Un. S. Afr. Dpt. Agr. and For., Sci. Bull.* 188, 1939. From *Exp. Sta. Rec.*, **86**, 3, 1942, p. 351.) The life-history and symptoms induced by *Heterodera marioni* are described. In this work infestations were effectively checked by starvation, eliminating all susceptible host plants. Clean cultivation for periods of 9 and 12 months gave better control than the 6-mo. summer or the 6-mo. winter treatment.

459. Cotton Root Rot Studies. By C. H. Rogers. (*53rd Ann. Rpt. Texas Agr. Exp. Sta.*, 1940, p. 168.) The results of the following studies are briefly discussed: The effect of rate of planting cottonseed on cotton root rot; the residual effect of different soil treatments on root rot in cotton; soil treatments for cotton root rot; relative humidity as affecting death rate of cotton plants with root rot; residual effect of crude oil, crank case drainings, and cotton bur ashes on germination of cottonseed, root rot, and yield of cotton; residual effect of applications of crude oil at different depths on germination of cottonseed, root rot, and yield of cotton; application of copper sulphate and crude oil in combination with deep tillage as affecting root rot in cotton; germination of seed and yield of cotton from seed from plants killed by root rot at different dates in 1939; analysis of cottonseed from cotton varieties grown in 1939 having different dates of maturity and different boll and lint characteristics.

460. Root Rot and its Control. By R. F. Crawford. (*New Mexico Sta. Bull.* 283, 1941. From *Exp. Sta. Rec.*, **86**, 2, 1942, p. 203.) *Phymatotrichum*

omnivorum root rot is an important plant disease in New Mexico and other parts of the South-west. It is native to the South-west, where the soils are alkaline, and has not been reported from areas where the soil is acid. This bulletin summarizes present knowledge concerning root rot, including the results of studies by the Station since 1921 relative to its distribution, economic importance, hosts, symptoms, etiology, life-history of the causal fungus, and control. Rotation with non-susceptible crops has long been recommended, but less than a 3-year rotation has proved of little value in the Mesilla and Pecos Valleys.

461. Studies on the Root-Rot Disease of Cotton in the Punjab. XI. Effect of Mixed Cropping on the Incidence of the Disease. By R. S. Vasudeva. (*Ind. J. Agr. Sci.*, xi., 6, 1941, p. 879.) Describes experiments carried out at Lyallpur, and some experiments conducted at Khanewal to confirm the results obtained at Lyallpur. These results indicated that when cotton is intercropped with sorghum or *moth* (*Phaseolus aconitifolius*) the incidence of the root-rot disease is significantly reduced. Soil and air temperatures are lower within the mixed crop but humidity is higher than in the pure cotton plots. Two varieties of American cotton (LSS and KT25) when sown in mixture with *moth* gave higher yields than the pure cotton. Incidence of the disease is also reduced when cotton is sown in mixture with certain other crops.

[*Cf.* Abstrs. **307**, Vol. XIII., **127**, **711**, Vol. XIV., **139**, Vol. XV., **509**, **709**, Vol. XVI., **235**, Vol. XVII., **178**, Vol. XVIII., **192**, Vol. XIX. of this Review.]

462. Factors influencing the Growth of *Phymatotrichum omnivorum* on Different Sources of Nitrogen. By P. J. Talley and L. M. Blank. (*53rd Ann. Rpt. Texas Agr. Exp. Sta.*, 1940, p. 85.) Experiments have shown that the utilization of ammonium nitrogen results in a more acid reaction in the media which may become a controlling factor in the growth of *P. omnivorum*. The utilization of nitrate nitrogen by the organism results in a drift toward a more alkaline reaction and usually does not retard growth. Experiments using carbonates and organic buffers show that ammonium nitrogen and nitrate nitrogen are of equal value in the nutrition of the organism when a favourable *p*H is maintained. No direct toxicity of ammonium has been observed.

463. Some Factors influencing the Utilization of Inorganic Nitrogen by the Root-Rot Fungus. By P. J. Talley and L. M. Blank. (*Pl. Physiol.*, xvii., 1, 1942, p. 52. From *Rev. App. Mycol.*, xxi., 6, 1942, p. 287.) A detailed, tabulated account of the writers' laboratory studies at the Texas Agricultural Experiment Station on the factors affecting the utilization of inorganic nitrogen by *Phymatotrichum omnivorum* in synthetic nutrient solutions. The consumption of nitrate nitrogen is influenced by the balance between potassium and magnesium, both of which are tolerated over a wide range providing the ratio of one to the other is neither unduly high nor extremely low. To a limited extent calcium may be substituted for magnesium and sodium for potassium. Ammonium utilization is modified by the ionic balance in the solution, the uptake by the organism of this source of energy being promoted, for instance, by high magnesium and high phosphates and by high calcium or sodium and high sulphates or chlorine, whereas a combination of high magnesium and high sulphates or chlorine acted adversely on growth. *P. omnivorum* proved to be tolerant of nitrites and able to assimilate nitrite nitrogen.

464. Antecedentes sobre la "Roya" del Algodonero en la Republica Argentina. By M. A. DiFonzo. (*Bol. Mens.* No. 73, *Junta Nac. del Algodon*, Buenos Aires, 1941, p. 419.) Some aspects are considered of this generally little known rust (*Cerotelium desmium*) of cotton in Argentina. The history and

nomenclature of the fungus, and the symptoms, method of transmission, and importance of the disease are briefly discussed.

465. *Sclerotium rolfsii* ON COTTON IN ARIZONA. By M. Gottlieb and J. G. Brown. (*Phytopathology*, xxxi., 10, 1941, p. 944. From *Rev. App. Mycol.*, xxi., 3, 1942, p. 138.) In addition to the recognized symptoms, the Arizona strain of *Sclerotium rolfsii*, which has caused such heavy damage to the cotton crop in the Salt River Valley and elsewhere during the past few years, was found to be responsible for a swelling of the main stem near the soil-line, apparently a sequel to seedling infection. The fungus was most prevalent in nematode-infested soils, but was also present in fields free from the agent of root knot; it spread in a somewhat sporadic fashion following irrigations and summer rains throughout the growing season. About December 16, a month after a killing frost, *S. rolfsii* showed much activity in these infested fields. Of great significance in relation to the perpetuation of infection is the detection of an abundance of inoculum on the decaying, ploughed-under stalks of the preceding cotton crop in fields showing no dying plants. The pathogen was first observed in Arizona in 1936 on larkspurs (*Delphinium*) and subsequently appeared on sugar beets about 150 miles distant from the site of the first outbreak; it was next observed on the latter crop some fifteen miles east of the affected cotton fields, to which, however, the manner of transmission remains for the present obscure. Mature cotton plants sustained exceptionally heavy damage from southern sclerotial rot in the epidemics under investigation, whereas Ezekiel and Taubenhaus found only one dying from the effects of the disease, while their inoculation experiments of mature plants failed.

[*Cf.* Abstr. **600**, Vol. IX. of this Review.]

466. HOW *Tirak* AFFECTS PUNJAB-AMERICAN COTTONS. By R. H. Dastur. (*Ind. Frmg.*, April, 1942, p. 181.) The Punjab-American cottons in the Punjab suffer from a physiological disease popularly known as *tirak* or bad opening of the bolls. The cotton crop, which is generally sown in May, appears healthy and normal up to September, when the crop is in its flowering phase. The symptoms of the disease first appear in the leaves, which begin to turn pale green and yellow. This is followed by reddening and shedding of the leaves. The bolls remain small and crack prematurely. The seeds in such bolls are partially or fully immature and bear very trashy lint which does not fluff out of the bolls. Normally 400 to 500 bolls are required to yield one seer (2 lb.) of *kapas*, but from 600 to 2,000 bolls are required when *tirak* is prevalent. The disease occurred in intense form in 1921, 1926 and 1928 and enormous losses were caused. Two types of soil were found to be associated with *tirak*: (1) light sandy soils with nitrogen deficiency and (2) sandy loams with salinity in the subsoil. The effects of these two types of soil on the growth of the cotton plant, and the intensifying effects of unfavourable weather conditions, are discussed.

[*Cf.* Abstr. **309**, Vol. XIX. of this Review.]

467. *Trichogramma.* (ECOLOGY AND RESULTS OF UTILIZATION FOR THE CONTROL OF INJURIOUS INSECTS.) By N. F. Meier. (Moscow, Sel'khozgiz, 1941. Price 5 rub. In Russian. From *Rev. App. Ent.*, xxx., Ser. A, 8, 1942, p. 373.) The author has summarized and brought together in this book data from the world literature on the bionomics and ecology of egg-parasites of the genus *Trichogramma*, with special reference to recent work carried out in the Russian Union on their value for pest control. The first chapter deals with the species of *Trichogramma* that have been observed in the Union, and following chapters with the effect of environmental and other factors on their development and fertility. *Sitotroga cerealella* Ol. has proved so far the only suitable host for breeding the parasites on a large scale in the laboratory, and since special precautions have to

be taken to prevent its spread to stored grain attempts are being made to produce a wingless strain. Further subjects dealt with are the means by which the parasite spreads in a locality, its distribution in the crown of the tree, the technique of liberation, and methods of estimating its effectiveness against pests of different crops. The final chapter comprises a detailed survey of the practical results obtained with the various forms of *Trichogramma* in the Russian Union. The cotton pests against which they have proved of value are *Loxostege sticticalis* L. and *Heliothis armigera* Hb.

468. Some Points still to be worked out in the Cotton Wilt Disease. By G. S. Kulkarni. (Gwalior.) (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, p. 168.) The seed-borne nature of the disease is obvious. But the fungus has not been located in the seed. Whether it occurs in the seed coat or in the cotyledons is still to be known. That it is not carried on the surface of the seed nor in its upper epidermal layers is quite certain in view of the effects of sulphuric acid treatment. The disease is prevalent in the black cotton soils and generally absent from alluvial soils. But even in the latter there are a few places where wilt is rampant. The reasons for this distribution are quite obscure.

469. The Reaction of Cotton Varieties to Fusarium Wilt and Root-Knot Nematode. By A. L. Smith. (*Phytopathology*, xxxi., 12, 1941, p. 1099. From *Rev. App. Mycol.*, xxi., 4, 1942, p. 197.) Observations in the Coastal Plain area of Georgia in 1940 indicated an association between resistance to the root-knot nematode (*Heterodera marioni*) infestation and freedom from wilt (*Fusarium vasinfectum*), but the relationship appears to be casual, since some wilt-resistant varieties—*e.g.*, Delfos 425, Dixie Triumph 06-366, and Sea Island Seabrook 31-12 B-2—show no more resistance to root knot than the wilt-susceptible and semi-resistant varieties. Resistance to *H. marioni* was confined to wilt-resistant varieties originating in the lighter types of local Coastal Plain soil in South Carolina, such as Early Wilt, Coker's 4 in 1 strain 4, and Wannamaker Cleveland, whereas the wilt-resistant types developed on the heavier soils of Mississippi and Louisiana, where root knot is a less acute problem, were all susceptible to the nematode. Plant breeders and pathologists would be well advised to devote some attention to the selection of strains combining resistance to the nematode and fungus. In this connexion the writer describes a system for the numerical evaluation of nematode infestation in cotton plants, whereby an increasing incidence of root knot can be represented by a rising scale of numbers from 0 to 4.

GENERAL BOTANY, BREEDING, ETC.

470. Cytology, Genetics and Evolution. By M. Demerec *et al.* (Philadelphia: Univ. Pa. Press, 1941. From *Exp. Sta. Rec.*, **86**, 2, 1942, p. 171.) Papers are presented on the fundamentals of cytology and their application to genetics and evolution.

471. The Physiology of the Gene. By S. Wright. (*Physiol. Rev.*, **21**, 3, 1941, p. 487. From *Exp. Sta. Rec.*, **86**, 2, 1942, p. 171.) A review and discussion of the relation of gene reactions and interactions in a wide variety of plants and animals including, especially, quantitative interpretations of multiple allelic series in guinea-pigs and their effectiveness in controlling melanin production. Gene control of extra-organic structures is considered especially complex. There are 274 references to the literature.

472. Selectivity of the Common Genes. By P. D. Gadkari. (Indore.) (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, p. 34.) In a field crop of *desi* cottons four types occur differing from one another in respect of simple Mendelian factors

for corolla colour and leaf shape. These types are found in varying proportions in different tracts of India. Competition experiments were undertaken to ascertain the presence of any selective advantage that could explain the local status of the four types. The results are held to prove the existence of such advantage, resulting in the occurrence in excess of the expected proportions of the types favoured by natural selection.

473. Eine Biophysikalische Analyse des Mutationsvorganges. By N. W. Timofeeff-Ressovsky. (*Nova Acta Leopoldina*, 9, N.F., 1940, p. 209. From *Pl. Bre. Abs.*, xii., 3, 1942, p. 166.) The work offers a comprehensive description of our present knowledge on the process of mutation and on the nature of the gene itself, especially as reached by biophysical investigations. By the use of exact quantitative methods, one can obtain from the action of ionized rays on the mutation frequency of the gene (gene or point mutations) quite definite ideas on this process. These are summarized in the " Treffer " theory (Timofeeff, Zimmer and Delbruck). According to this, the primary event for the liberation of a gene mutation is a single ionization occurring in a definite space (Treffbereich). The mutation itself is a structural change of a single, well defined atomic combination (molecule, micelle or part of a micelle). From this assumption it follows also that the gene itself or its most important part must represent a physico-chemical unit. Here there is an interesting and surprising connection with virus research, the conception of the gene as a physico-chemical unit is strongly supported by the discovery that at least many virus species are chemically individual mono-molecular structures supplied with the possibility of reproducing convariants of themselves and eliciting specific physiological actions, characteristic also of genes. This latter indicates that the investigation of the mutation process and the structure of the gene ranges to-day far beyond the bounds of true genetics and requires the coöperation of biophysics, biochemistry, virus and immunity research. The present results are drawn almost entirely from the zoological side (from Drosophila) and this work is built up almost entirely from zoological literature. However, in spite of this it is welcome from the botanical side as an outstanding review of this important field of research.

474. Genes and Chromosomes—Structure and Organization. Cold Spring Harbour Symposia on Quantitative Biology. (George Banta Pubg. Co., Menasha, Wisconsin, 1941. Price $4.10. From *Pl. Bre. Abs.*, xii., 2, 1942, p. 180.) The 1941 annual symposium on quantitative biology at Cold Spring Harbour was devoted to genes and chromosomes. Contributions by distinguished workers were presented on genetical, cytological, physical and chemical aspects, and these, together with the discussions which followed them, are published in the volume. The following papers are of more direct interest to plant breeders: " Chromosome continuity and individuality " (H. E. Warmke); " Multiple chromosome complexes in animals and polysomaty in plants " (C. A. Berger); " Spontaneous alterations in chromosome size and form in *Zea mays* " (B. McClintock); " The genetic control of mutability in maize " (M. M. Rhoades); " The comparison of ultra-violet and X-ray effects on mutation " (L. J. Stadler); " Mutation in Drosophila, bacteria and viruses " (J. W. Gowen); " The chemical composition of strains of tobacco mosaic virus " (W. W. Stanley and C. A. Knight). This selection gives an adequate idea of the scope and importance of the book, which deserves careful study from all interested in the progress of genetics. The only conspicuous deficiency concerns Darlington's cytogenetical theories; in places these are almost studiously ignored, in places they are in part tacitly accepted, but nowhere are they adequately discussed. Under the title of " Résumé and perspectives of the symposium on genes and chromosomes " H. J. Muller gives a masterly survey of the material presented at the Conference, and

knits together the evidence derived from microscopic study of the chromosomes, from investigations of mutations (gene and chromosome) and from biochemical and physical studies. The result is a thorough and constructive account of the present position of our knowledge of genes and chromosomes. In conclusion he describes an hypothesis to account for the specific attraction which it has been inferred must bring like parts together both in gene synthesis and synapsis, an hypothesis of super-resonance in large protein molecules.

475. GENETICS AND THE RUSSIAN CONTROVERSY. By K. Mather. (*Nature*, 149, 1942, p. 427. From *Pl. Bre. Abs.*, xii., 3, 1942, p. 149.) The author agrees with Lysenko that genetics has not contributed very much to the improvement of crops and stock, and suggests that this is due to geneticists neglecting the study of polygenic characters. The neglect of polygenetics is attributed to the early controversy between the Mendelians and the biometricians, to technical difficulties in the analysis of polygenic segregation and to geneticists being interested in other subjects such as linkage (from 1910 onwards), X-ray mutations (from 1927 onwards), Darlington's recasting of cytology in an inductive-deductive form in the early 1930's, giant salivary gland chromosomes in Drosophila (significance of these being understood in 1934) and Beadle and Ephrussi's investigations on gene action in 1935. It is suggested that the rejection of the whole of genetical theory is useless, and that an extension of experimental research on polygenetic inheritance will enlarge genetical theory so that it will be of real value to breeders.

[*Cf.* Abstrs. **260**, Vol. XVII., and **462**, Vol. XVIII. of this Review.]

476. I. GENÉTICA E SELECÇÃO. II. A GENÉTICA CONTINUA A SER ATACADA. By A. de Souza da Camara. (*Rev. Agr. Lisboa*, 1939, **27**, p. 410. *Ibid.*, 1940, **28**, p. 330. From *Pl. Bre. Abs.*, xii., 2, 1942, p. 114.) An outline is given of the genetics controversy in the Soviet Union. The author admits the desirability of conducting breeding operations in the best possible conditions of growth, and that an absolutely pure line is never attained in practice. Hence the possibility of effecting an improvement in an existing variety by selection or by intravarietal crossing is admitted on purely genetical grounds. Owing to the heterozygosity of most experimental material it is conceded that the nature of the environment may influence the results of selection, but the weight of experimental evidence against the direct inheritance of acquired characters is regarded as too great to be readily discounted. With regard to vernalization, it is pointed out that heat and cold treatment may well result in mutation, which may be the cause of some of the hereditary results described. It is further pointed out that deviations from simple Mendelian ratios are frequently found to have some clear genetical or cytological cause and do not in themselves refute the whole science of genetics.

477. MEMOIRS OF THE COTTON RESEARCH STATION, TRINIDAD. (Pubd. by the Empire Cotton Growing Corporation. Price 2s. 6d.) The eighteenth number of Series A, Genetics, has recently been published, and contains the following paper reprinted from the *Journal of Genetics*:

ANTHOCYANIN PATTERN IN ASIATIC COTTONS. By R. A. Silow and C. P. Yu. Seven additional types of anthocyanin in cotton are described and shown to be controlled by members of an extensive allelomorph system of which fourteen members are now known in the cultivated diploid Asiatic species *Gossypium arboreum* and *G. herbaceum*. All seven of the new types were found in China—six in field material, and the seventh as an anomaly in experimental cultures. The information relating to the genetical behaviour of this and similar series, whose manifold expressions do not conform to a single simple seriation, is reviewed from the standpoint of deciding between the alternative interpretations of close linkage and multiple allelomorphism with pleiotropy. Although the cotton series, in

which a new "pattern" arrangement appeared under controlled conditions, might have been expected to be a particularly suitable subject for this purpose, it was not possible to reach a definite conclusion on the experimental evidence.

478. A New Gene affecting Anthocyanin Pigmentation in Asiatic Cottons. By K. Ramiah and B. Nath. (*Proc. 28th Ind. Sci. Congr., Benares*, 1941, Pt. III., Sect. Agr., p. 258. From *Pl. Bre. Abs.*, xii., 3, 1942, p. 157.) A new member of the R_2 series of alleles controlling anthocyanin pigmentation in Asiatic cottons is reported.

479. Note on a New Gene affecting Leaf Shape in Asiatic Cottons. By K. Ramiah and B. Nath. (*Curr. Sci.*, **10**, 1941, p. 490. From *Pl. Bre. Abs.*, xii., 3, 1942, p. 157.) In the South Indian cotton variety C_7 (a form of *G. arboreum* var. *neglectum* f. *indica*), which has lobed broad leaves, there has been isolated a mutant, the first one or two leaves of which are nearly normal but the later leaves of which show a progressive reduction of the two lateral lobes resulting in tadpole-shaped leaves, and finally in leaves consisting of only the single middle lobe. In crosses the mutant type behaved as a simple recessive to the normal lobed type, and it was also shown that the new gene pair (*S*-*s*) is not a member of the *L* series of allelomorphs.

480. The Genetical Behaviour of Three Virescent Mutants in Asiatic Cotton. By C. P. Yu. (*J. Amer. Soc. Agron.*, **33**, 1941, p. 756. From *Pl. Bre. Abs.*, xii., 3, 1942, p. 185.) Three virescent mutants, differing from one another and from the previously reported v_1, occurred in 1935-37 and are described. Data are presented to show that v_1 and v_2 are inherited independently and are complementary factors, and that v_3 and v_4 are independent; v_4 is inherited independently of the genes for anthocyanin pigment, corolla colour, and curly leaf. [*Cf.* Abstr. **277**, Vol. XVII. of this Review.]

481. Further Studies on the Punjab Hairy Lintless Gene in Cotton. By K. Ramiah and P. D. Gadkari. (*Proc. 28th Ind. Sci. Congr., Benares*, 1941, Pt. III., Sect. Agr., p. 258. From *Pl. Bre. Abs.*, xii., 3, 1942, p. 157.) The gene has been found to affect differentially the viability of the type under different environmental conditions, to disturb segregation for leaf shape, and to affect the growth of the plant according as it is present in heterozygous or homozygous conditions.

482. The Influence of any Internal Genetic Change in a Standard Variety of Cotton upon Fibre Length. By J. H. Moore. (*J. Amer. Soc. Agron.*, **33**, 8, 1941, p. 679. From *Exp. Sta. Rec.*, **86**, 4, 1942, p. 471.) Mass-selfed and open-pollinated progenies of a Mexican strain of American Upland cotton were planted for 3 successive years on a field that had grown only Mexican strains. No change was noted in combed fibre length or in its variability or in plant type or seed after 1, 2, or 3 years of mass selfing or open pollination. Arrays on the Baer sorter showed no real differences in fibre-length distribution of ginned staple at the end of four seasons in a comparison of the two kinds of seed stocks with the original seed. Where contamination of seed is avoided, varieties registered or eligible for registration apparently do not run out as measured by fibre length.

483. A História da Evolução dos Algodóes Cultivados do Novo Mundo. By S. C. Harland. (*An. Primeira Reuniao Sul-Amer. Bot.* [1938], **1**, 1939, p. 215. From *Pl. Bre. Abs.*, xii., 1, 1942, p. 58.) Reference is made to the transference of the gene for red leaf from a diploid species (*Gossypium arboreum*) to a tetraploid (*G. barbadense*), where it proved to be a new member of an existing allelic series. New World wild diploids of the groups *armourianum*, *Harknessii*, *aridum* and

trilobum have also been shown to possess homology with the tetraploid group. Cytological evidence is adduced in support of the view that these two groups of diploids represent the respective ancestors of the tetraploid New World group. The union is thought to have occurred when there was land connection between the Pacific coast and Malaya, thus probably in the Cretaceous. Relics of other tetraploids have remained on the islands such as Hawaii and Fiji, the only parts of this land connection that have not been submerged. *G. barbadense* was apparently domesticated by the Incas, *G. hirsutum* by the Aztecs, and *G. punctatum* (=*G. Hopi* Lewton) by the North American Indians, the tropical monopodial (tree) forms being the original types. The greatest concentration of genes of *G. barbadense* has been found by the author in the valley of Cauca in Colombia, which is therefore regarded as the probable centre of origin of this species. The corresponding centres for *G. hirsutum* and *G. punctatum* would appear to be southern Mexico; the centre for *G. purpurascens* remains doubtful. This last-named species is thought to have great possibilities for breeding, since it is adapted to an unusually wide range of climatic conditions and has lint of first-rate quality.

484. The Effect of Genetical Factors, Seasonal Differences and Soil Variations upon Certain Characteristics of Upland Cotton in the Yazoo-Mississippi Delta. By J. W. Neely. (*Tech. Bull. No.* 28, Miss. Agr. Exp. Sta., 1940.) During the 4-year period 1935-38 field tests were conducted at Stoneville, Mississippi, to study the effect of genetical factors, seasonal conditions, and soil variations, and their interactions on 15 characteristics of Upland cotton. The cottons comprised 24 strains recently developed for commercial planting in the Mississippi Valley and pertaining to the Acala, Ambassador, Delfos, Deltapine, Express, Missdel, Rowden, Stoneville, and Washington varieties. It was found that differences between strains in regard to each of the 15 characteristics were significant. Yield and earliness characteristics were affected much less by genetical factors than were lint percentage, staple length, boll size, percentage of 5-lock bolls, seed index, and lint index. The effect of seasonal influences upon each of the 15 characteristics was highly significant and predominated over the effect of genetical factors and soil variations in regard to 12 of the characteristics. Staple length, percentage of 5-lock bolls, and seed index were affected more by genetical factors than by seasonal conditions. Soil variations exerted a significant influence on each characteristic, particularly lint percentage, boll size, seed index, and earliness; the effect upon yield characteristics and staple length, although significant, was to a less degree. Environmental factors that increase the percentage of lint might not always be desirable, for sometimes the initial effect is one of decreasing the weight of the seed, and may actually mean a decrease in the amount of lint produced per acre. Staple length and seed index were affected more by genetic than by environmental factors; size of boll and percentage of 5-lock bolls were affected by both groups of factors. Lint index and lint percentage were affected to about the same extent by genetic factors, but lint index was less affected by the environmental factors. Strain differences in regard to earliness, while highly significant, were relatively small. Effects of seasons, however, were very pronounced, and soil effects were highly significant.

485. The Handling of Chromosomes. By C. D. Darlington and L. F. La Cour. (George Allen and Unwin, Ltd., London, 1942. Price 8s. 6d. Reviewed in *Pl. Bre. Abs.*, xii., 3, 1942, p. 202.) This book has been written for teachers and students in schools and universities, but the authors suggest that the fixation and staining techniques described "should not come amiss to workers in the many branches of research for which the handling of chromosomes has now

become useful or perhaps even necessary. . . ." The following are among the more-recent techniques described: the use of substitutes such as dioxan, butyl alcohol, tertiary butyl alcohol, iso-propyl alcohol or methylal paraffin oil in dehydration and infiltration for either ethyl alcohol and xylol or ethyl alcohol and chloroform; the use of acetin-orcein and lacmoid indicator (resorcin blue), both these being used in a similar way to iron-aceto-carmine; and the Feulgen staining technique. Incidentally it is now suggested that acetin-orcein should not be used for material stored in 70 per cent. alcohol.

The book contains a preface, twelve chapters, five appendixes, a list of references and an index. It is illustrated by a number of text figures and sixteen excellent plates of chromosome preparations. These plates give a most satisfactory guarantee of the merits of the methods described. After an introductory chapter, the authors discuss equipment (this chapter includes a sensible account of the use of a microscope), living chromosomes, bulk fixation, smears and squashes, paraffin methods, staining and mounting, and special treatments (*e.g.*, those for showing spiral structure). Chapter 9 is called " The Control of Mitosis " and contains very short and rather fragmentary accounts of the actions of X-rays, drugs and temperature treatments on mitosis. The next chapter—its title is " The Control of Fertilization " and its subheadings are pollen germination, tube division, pollen storage, the style, haploid plants, haploid animals—is also rather scrappy. Chapters 9 and 10 include at least two mis-statements. Chapter 11 gives a useful account of methods used in microphotography. Chapter 12—its title is " Describing the Results "—is divided into three sections, interpretation, description, and a section setting out certain rules to be observed in writing papers. . . . The five appendixes deal with sources of material, standard solutions, schedules of treatment, implements, and abbreviations.

486. Cromosômios do Gênero Gossypium. II. Algodoeiro Mocó. By O. C. Góes. (*Arq. Serv. Florest.*, **1**, 2, 1941. From *Exp. Sta. Rec.*, **87**, 1, 1942, p. 44.) On the basis of the chromosome number (26 haploid) found in the Mocó variety of north-eastern Brazil, the author believes it should be grouped with the American cottons and affiliated with one of the species *G. hirsutum*, *G. purpurascens*, or *G. barbadense.*

487. Preliminary Observations on the Chromosome Morphology in Asiatic Cottons with Special Reference to their Phylogeny and Interrelationships. By K. T. Jacob. (Coimbatore.) (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, p. 42.) Previous investigators have reported the presence of two pairs of satellited chromosomes in the Asiatic cottons. The author has invariably found only one pair, while the other pair of nucleolar chromosomes was secondarily constricted. The basic number of somatic chromosomes is inferred to be 7 and on the basis of this the present-day Asiatic cottons are shown to be secondary allotetraploids having the constitution 4*b*-2. On the other hand, the American diploids are inferred to be secondary autotetraploids in that they have two pairs of morphologically similar satellited chromosomes.

488. Cotton Breeding and Genetics. By T. R. Richmond *et al.* (*53rd Ann. Rpt. Texas Agr. Exp. Sta.*, 1940, p. 74.) Experiments in the accumulation of lint production modifiers in certain smooth-seeded lines were continued during the year. Of the 86 progenies grown from the three most promising families observed last year 77 bred true for smooth seed, 20 of which were uniformly high in lint percentage with an average of over 20. Several of the better lines will be crossed with high-yielding, covered-seeded, normal lines to test the possibility of increasing the lint production in normal stocks with the modifying genes accumulated in the smooth-seeded stocks. A yield trial of 16 first

generation hybrids of *G. hirsutum* and *G. barbadense* was conducted. Hybrids of early maturing Upland types such as Half-and-Half, Stoneville, Delfos, and Nucala with Sea Island gave the best yields, several producing 450 lb. or more to the acre. The open pollinated seeds obtained from the insect pollination tests in which Upland and *barbadense* cottons were arranged in alternate rows in areas frequented by bees, were sown in a ⅛-acre block at the rate of 40 lb. to the acre. As the Upland parent stock carried the gene for red leaf, all of the intermediate red plants in the plat were hybrids and were left at thinning, while the full red-leaf Upland and the green-leaf *barbadense* plants were removed. One phase of the study of species hybrids was an attempt to transfer single characters observed in segregating generations of Upland × *barbadense* hybrids to Upland cotton and to build up lines that, except for a particular character, are essentially Upland in type. The characters, hirsute and petal gland, were recovered from first backcross generations, indicating at least partial dominance. Selfed progeny of these crosses threw individuals in which the expression of both characters was greatly intensified. Other characters recovered in the selfed progeny of backcrosses, but not observed in the initial backcross progenies, were: dark yellow pollen, bright flower bud, scattered boll gland, dwarf plant, and extra carpellary knobs.

[*Cf.* Abstr. **206**, Vol. XVIII. of this Review.]

489. Standardization of Experimental Technique in Cotton Breeding. By V. G. Panse. (Indore.) (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, p. 78.) A discussion of the application of statistical principles to the layout of field tests, and the examination of results in progeny row breeding. This involves a considerable amount of labour, but is amply repaid by providing an objective procedure for selection, thereby increasing its effectiveness.

490. Inheritance of Quantitative Characters with Special Reference to Cotton Breeding. By V. G. Panse. (Indore.) (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, p. 27.) The questions arising in the effort to secure progressive improvement by selection are closely linked with the study of the genetics of quantitative characters. The paper deals with some of the simpler consequences of Mendelian inheritance applied to quantitative characters, as very little is known about the more complex ones. Heritable variability can be considered as made up of two components, one arising from the additive action of the genes, and the other from their non-additive interactions, and it is the former that is most relevant to selection work. Methods are discussed for separating heritable from non-heritable variance. Crosses between parents differing only slightly may give as much variability as between those with a large difference.

491. Some Considerations in Breeding Cotton for Earliness. By S. J. Patel and D. D. Gopani. (Gujarat.) (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, p. 63.) Owing to the general tendency for the flower buds to shed so long as environmental conditions favour vegetative growth, foreign cottons, which are constitutionally early, fail to show early flowering under Gujarat conditions. Under these conditions extra early maturity in cotton—for the crop to escape frost damage and to grow well under deficient rainfall—can possibly be obtained by evolving quick-flowering strains with shorter bud and boll maturation periods, and by controlling bollworm attacks. From the cultural point of view it has been shown that certain manurial treatments induce early maturity in cotton in Gujarat, and, similarly, cotton following certain leguminous crops in rotation also matures early. A study of the effect of spacing on earliness has been suggested.

492. The Place and Methods of Breeding for Insect Resistance in Cultivated Plants. By R. O. Snelling. (*J. Econ. Ent.*, **34**, 1941, p. 335. From *Pl. Bre. Abs.*, xii., 2, 1942, p. 122.) After some general remarks on the type of organization and worker needed for research on varietal resistance to insect pests, the advances made so far are reviewed under the headings of introduction, selection, hybridization, and grafting.

493. Present Position as regards Breeding for Jassid Resistance in Cotton. By M. Afzal. (Lyallpur.) (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, p. 54.) None of the reputedly resistant varieties, with the exception of Cambodia, have been found to be resistant to jassid in the Punjab. Among other factors studied it has been proved that as the date of sowing is delayed the injury due to jassid is increased. Spacing experiments have so far not shown any difference in insect population. Sparsely hairy plants have been found which are highly resistant to the pest.

494. Breeding for Resistance to Cotton Root Rot in Gujarat. By G. K. Govande. (*Proc. 29th Ind. Sci. Congr., Baroda*, 1942, Pt. III., Sect. Agr., Abs. 43, p. 217. From *Pl. Bre. Abs.*, xii., 4, 1942, p. 215.) Surviving cotton plants from fields infested with cotton root rot [*Macrophomina phaseoli* (Maubl.) Ashby] showed partial resistance, and continuous selection on this material has given families which show a mortality of only 20-30 per cent. as against 95 per cent. shown by the susceptible variety Broach 9. Their spinning value, however, is very low, and it is proposed to effect further improvement by crosses with other types.

495. Further Studies in Breeding for Wilt-Resistance in Cotton. By B. N. Uppal *et al.* (Poona.) (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, pp. 157-8.) I. Isolation of Wilt-Resistant Types. Cotton strains and segregates of B.D.8 crosses that had been inbred for several years and grown in wilt-sick soil in the field were found to be highly segregating for wilt resistance in pot culture tests. Selections made in these strains and segregates under conditions of infection approaching the optimum led to the production of types fully resistant to wilt; but the homozygous condition was more rapidly reached in some strains than in others. This is obviously impossible in the field because of the difficulty in distinguishing between plants in which the symptoms of infection may be masked and those showing a high degree of resistance. As the development of wilt resistance in the cotton strains and segregates of B.D. crosses was achieved step by step, it is assumed that it is to be attributed to gradual elimination of modifying factors culminating in the production of full resistance. The elimination of these factors is easily effected under optimum conditions of infection in pot culture but is difficult in the absence of such conditions, as for example in the field. Another point of interest emerging from these results is that selection in pot culture did not yield any immune types. The selected types, though susceptible to invasion by the wilt organism and thus exhibiting symptoms of leaf mottle, did not suffer mortality from wilt even under conditions most favourable for the development of the disease. Such types have been designated as fully resistant or 100 per cent. resistant.

II. A Preliminary Note on the Genetics of Wilt Resistance in Indian Cottons. Results of F_2 and backcross families of *Gossypium herbaceum* crosses showed that resistance to wilt was due to a single genetic difference, whereas in *G. arboreum* crosses this character involved three complementary genes. In all crosses resistance was incompletely dominant. The occurrence of a proportion of fully susceptible plants (*i.e.*, plants that wilted) in the F_1's may be explained on the assumption that the resistant parents are heterozygous for the modifying factors which they carry.

496. Breeding Cotton for Wilt Resistance under Field Conditions. By P. L. Patel and Y. S. Kulkarni. (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, p. 164.) The three important factors influencing the expression of wilt under field environments are rainfall, soil temperature, and the degree of soil infestation by the wilt pathogene. It is possible, to a large extent, to create a uniform spread of the wilt fungus by continuous growth of a 100 per cent. susceptible variety on the same plot for a number of years, and also by adding wilt compost before commencing to test the wilt resistance of cotton strains. It is impossible to regulate rainfall and soil temperature due to vagaries of seasons, and this results in an uneven expression of wilt from season to season. Strains tested in fields under fluctuating seasonal conditions are likely to carry on temporary resistance. Hence the necessity of finally testing them under standard conditions of soil moisture and soil temperature in pots. One backcrossing of the hybrid with the resistant parent appears to be a fairly reliable method to obtain material of better resistance than the straight cross.

497. Progress of Plant Pathological Research in Bombay. By M. N. Kamat. (*Poona Agr. Coll. Mag.*, 33, 1941, p. 97. From *Pl. Bre. Abs.*, xii., 3, 1942, p. 148.) Work of the section during the last fifteen years is briefly reviewed. A special technique for the selection and testing of wilt-resistant types of *Gossypium* suitable for cultivation in the cotton-growing areas of the province is described, and it is claimed that the method has resulted in the production of 100 per cent. wilt-resistant types.

498. Studies in the Physiology of the Broach Cotton Plant. By K. V. Joshi, R. B. Gode and A. K. Shah. (*Sci. Monog. No.* 1, Ind. Cent. Cott. Comm. 609 pp. Bombay, 1941. Price: Rs. 5-8.) The work described in this volume covered a period of nine years from 1923, and was carried out at Surat by a team of workers under the direction of the senior author, whose preface to the report is dated 1933. The text occupies 289 pages, and the remainder consists mainly of tables of data. There is a short appendix of analytical methods, a bibliography and an index. The object of the investigation was to discover (1) the factors governing the shedding of buds and bolls, (2) the relation of shedding to yield, and (3) the measures which could be adopted to keep shedding under control.

The approach was made on a wide front, and only at a late stage narrowed down to questions of nutritive balance, so that the studies provide an account as complete as could be made from many lines of investigation of the behaviour of the plant under the prevailing conditions and in relation to the crop. Accordingly the results have both general and specific interest much beyond that of their bearing on the problem in view.

The account opens with a detailed description of the conditions of crop production and proceeds to describe the development of the cotton plant under these conditions. In this section the extravagance in the inception of the reproductive organs is revealed. On an average 300 flower buds are produced per plant, 76 reach the stage of open flowers, 43 shed as young bolls, and only 30 grow into ripe bolls. A large proportion of shed bolls bear apparently no injury; neither lack of fertilization of flowers nor any parasite is responsible. The spotted bollworm causes considerable injury and loss of crop, but elaborate experiments with protected plants showed that even in its absence shedding is almost as heavy.

Succeeding chapters report on a chemical study of the cotton plant under varied conditions; describe experiments carried out for studying the effects of various treatments on growth and yield, including water supply, plant food supply, and manipulations such as defoliation and disbudding; discuss the influence of the factors governed by the weather and the ways in which they give rise to annual variations in growth.

The final chapter brings together the recorded results and discusses their bearing on bud and boll shedding and its significance in crop production. All are held to indicate and even place beyond doubt the fact that the causes of shedding are nutritional in character, and that shedding occurs as a direct consequence of insufficiency of food in the plant. This deficiency operates primarily in two ways: (1) when the quality of the sap is not conducive to the growth of buds and bolls, and (2) when, though suitable in quality, it falls short in quantity.

(1) During the vegetative phase the ratio of carbohydrates to nitrogen in the leaf sap is at a very low level. In the next stage spells of dry weather and bright sunshine increase photosynthetic activity, the relative concentration of carbohydrates rises and the reproductive phase begins. Fluctuations in the weather of the transition period from the rainy to the dry season cause disturbances of the ratio and consequent shedding. This condition persists until settled weather enables the ratio to remain constant at a higher level, which brings about a greater rate of production and a greater rate of success of reproductive forms. Occasional heavy shedding may still occur if a break in the weather reduces assimilation.

(2) As the number of established flowers and bolls increases they make demands which steadily approach the limit of the quantitative food resources of the plant. Vegetative growth slowly declines and with it assimilatory activity. When this limit is reached no further bolls are able to establish themselves, and all those formed in the closing weeks of the flowering period are shed at one stage or another.

The conclusion is that natural shedding does not lower the yield. At any stage the number of buds, flowers, or bolls on the plant is in excess of its capacity to maintain them. Bollworm damage, on the other hand, may reduce yield as much as 30-50 per cent. It takes a constant toll of established organs and delays compensatory boll-setting into the period when the reduced assimilatory capacity no longer suffices to bring them to maturity.

It follows from the general conclusions summarized above that the retention of a larger number of flowers and bolls, and consequently an increased yield, would follow an increased food supply taken up by the plant, and it is shown that in the Broach cotton area the limiting factor is nitrogen. By maintaining a steady supply of nitrogen at all times the yield of the plant has been raised four- to five-fold, and applications for shorter periods give proportional increases. Forty pounds of nitrogen given in water at an early stage have doubled the yield of seed cotton.

The effect of nitrogen in improving both the retention and development of flower buds and bolls is governed by the stage of growth when nitrogen is made available to the plant. If it is given from the stage of bud development, it increases the percentage success of bolls into flowers; if applied later during the stage of boll development, bolls succeed in larger proportion, and even the yield of seed cotton per boll and nitrogen content of seed are enhanced.

Under conditions of crop production nitrogen has to be applied in one dose during the seedling stage to get the fullest benefit of rain-water to make it available. Experiments have shown that sulphate of ammonia in quantities from 100 to 200 lb. per acre leads to proportional increase of yield of from 20 to 40 per cent. Under the conditions prevailing the value of the increase no more than met the cost of the application, and the need is indicated for sources of cheaper nitrogen to be sought.

499. Pasternack's Paraffin Method modified for Plant Tissue. By K. R. Kerns. (*Stain Tech.*, 6, 1941, p. 155. From *Pl. Bre. Abs.*, xii., 2, 1942, p. 117.) A rapid method for preparing paraffin sections of plant material. Root tip chromosome counts can be made approximately three hours after taking the root tips.

500. Cotton Roots: Growth in Culture Solutions. By C. Wilson. (*Proc. Assoc. Southern Agric. Workers*, **42**, 1941, p. 209. From *Summ. Curr. Lit.*, xxii., 2, 1942, p. 24.) Sucrose is the best source of carbohydrate for the growth of excised cotton roots, and glucose is next best. Fructose and brown sugar inhibit growth. A good culture solution for the growth of 1-2 cm. root tips at 25-30° C. in the dark, subcultures being made at weekly intervals, consists of $Ca(NO_3)_2$ 190, $CaH_4(PO_4)_2$ 58·5, KCl 48, $MgSO_4$ 78, $Fe_2(SO_4)_3$ 0·9, vitamin B_1 0·1, nicotinic acid 0·5 mg., and sucrose 20 gm., made up to 1 litre with redistilled water.

501. Cotton Plant: Nutrient Requirements. By V. I. Tsivinskii. (*Sbornik Rabot po Biol. i. Fiziol. Khlopchatnika*, 1939, 65-86. From *J. Text. Inst.*, June, 1942, A254.) Experiments on the Russian long-staple cotton No. 8517 show that during the growth of the plant up to budding an abundant supply of P is essential and thereafter the N supply is important. Heavy dressing with phosphates before planting and N fertilization at budding produced rapid growth and a heavy crop.

502. Cotton Plant: Effect of Ammonium Nitrate on Development. By A. A. Lazarev. (*Trans. Dokuchaev Soil Inst.*, **22**, 1, U.S.S.R., 1940, p. 159. From *Summ. Curr. Lit.*, xxii., 13, 1942, p. 293.) Ammonia N is not favourable for cotton fertilization on saline soils. With kainite the negative effects on the early development of the plants were not eliminated, but the yield of bolls was higher and the total yield therefore was also higher.

503. Variability of Stand and Yield of Cotton under Field Conditions. By R. J. Kalamkar. (C.P. and Berar.) (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, p. 130.) Observations indicating the possibility of forecasting the yield of cotton by developing a suitable technique for estimating the number of bolls per plant, plant population per unit area, and the weight of seed cotton per boll.

504. Relative Growth Rate of the Main Stem of the Cotton Plant and its Relationship to Yield. By N. I. Hancock. (*J. Amer. Soc. Agron.*, **33**, 7, 1941, p. 590. From *Exp. Sta. Rec.*, **86**, 3, 1942, p. 321.) Plants of Upland cotton varieties grown under field conditions at Knoxville, Tennessee, were studied, 1931-38. Plant height was found to be associated closely with the potential as well as the actual crop of bolls. Measurement of 4,679 plants during 3 years revealed that from 70 to 80 per cent. of bolls were in the vertical fruiting areas nearest the main stem. Shedding mainly took place horizontally along the fruiting limb. The curve representing growth rate of the plant was sigmoid, confirming results of others. The velocity of the growth curve was found most rapid from July 1 to August 5, and the data were fitted by the exponential equation $H=Ae^{kt}$, when written in the linear form. The variable expressing the velocity of this period was associated with yield.

505. Synthetic Ability of Plants as affected by Vernalization. By I. N. Konovalov and T. M. Popova. (*Comp. Rend.* [*Dok.*] *Acad. Sci. U.S.S.R.*, Ser. 31, 1, 1941, p. 58. From *Exp. Sta. Rec.*, **86**, 6, 1942, p. 758.) From studies of the accumulation of organic matter, formation of protein per unit time in leaves, and the enzyme activity of the plants, it is considered probable that the acceleration of leaf growth and changes in enzyme activity furnish the main basis for the increased productivity following vernalization.

506. Leaf Albumins as an Index for Salt Resistance of Cotton Plants. By B. P. Strogonov and L. Ostapenko. (*Comp. Rend.* [*Dok.*] *Acad. Sci. U.S.S.R.*, N. Ser. 30, 1941, No. 1, p. 66. From *Exp. Sta. Rec.*, **86**, 3, 1942, p. 304.) In the tests reported the protein in the plant tissues increased with the concentration of salts in the soil, as did also the plants' resistance to the salts.

507. Cotton Leaves: "Silvering" in Sun and Wind. By M. A. DiFonzo. (*Bol. Mens. No.* 72, 1941, p. 303. Junta Nac. del Algodon, Buenos Aires. From *J. Text. Inst.*, March, 1942, p. A116.) Leaves showing patches of silvered or leaden appearance on the back have been observed on cotton plants in positions where they are exposed to the direct action of wind and sun. The discolorations appear to be purely local effects not due to parasites and without influence on the life of the plant. Abnormal exposure of the lower face of the leaf results in rapid and excessive transpiration and transverse folding retards circulation of the sap and disturbs nutrition. Examination of affected parts of leaves shows that the layer of cells of the lower face is separated from the rest of the parenchyma by a layer of air. The silvered effect has been produced experimentally by folding leaves on plants and exposing to direct sunlight. Leaves folded longitudinally acquired a reddish tint on exposure of the lower surfaces in this way, whilst leaves folded transversely acquired first a reddish tint and later a silvered appearance. Folding of leaves in the field may be caused by winds or by damage caused by parasites or other agents.

508. A Note on the Variation in the Standard Fibre Weight of the Cotton Fibre in Relation to its Length. By R. L. N. Iyengar. (*Ind. J. Agr. Sci.*, xi., 6, 1941, p. 876.) Tables are given showing the observed and standard fibre weights corresponding to different lengths in the strains Co.1 and Co.2 (*G. hirsutum*), and K.546 (*G. arboreum*). In all the three cottons the standard fibre weight systematically increased with decrease in length. In Co.1 and Co.2 the differences between the extreme values of the observed fibre weight per centimetre were 17·2 and 20·2 per cent. respectively. These were reduced to 14·0 and 12·2 per cent. respectively in the standard fibre weight. In the case of K.546, however, the difference of 9·4 per cent. in the observed fibre weight increased to 22·6 per cent. in the standard fibre weight. In the first two cottons, therefore, the variations in the maturity caused exaggerated variations in the fineness among different grades, while in the third they had a masking effect. The studies indicate clearly that the presence of immature fibres has been the cause of the differential behaviour observed in different cottons, in the relationship between the fibre weight and lint length grades, and suggest that the maturity factor may be the cause for the non-variability observed previously in *G. arboreum* and Sakel.

509. A Method of Measuring the Strength of Attachment of Cotton Fibres to the Seed and some Results of its Application. By W. S. Smith and N. L. Pearson. (*U.S. Dpt. Agr. Market Serv. and Bur. Pl. Indus*, 1941. From *Exp. Sta. Rec.*, **86**, 5, 1942, p. 617.) A simple instrument of the pendulum type and appropriate technique were developed for measuring the force required to detach single fibres from the cottonseed. With it a skilful operator could attain the same accuracy as with a McKenzie single-fibre tester, which was found too time-consuming. When tufts of fibres were pulled from the seed by an apparatus for testing single strands of yarn, figures calculated to represent strength of fibre attachment to the seed for the cotton as a whole, for individual seeds, and for fibres at different positions on the seed were smaller than figures representing the mean strength of fibre attachment obtained by testing individual fibres, and are not considered to be accurate enough for fundamental studies. The strength of attachment of fibres on any given area of any particular seed varied from about 0·25 to about 5·5 gm. The mean strength of fibre attachment varied from area to area on the seed. Fibres on the rounded (chalazal) end of the seed had the lowest strength of attachment and those on the pointed end the highest. A sample of 256 fibres on the side of a seed about half-way between the ends was considered a representative sample for a seed. For

comparing two cottons, at least 10 or preferably 16 seeds, 1 from each of 10 or 16 bolls representing each cotton, are needed. Each seed is taken from the middle of the lock selected to represent the boll. Comparative tests of 41 selected cottons of different varieties and covering a wide range of seed-cotton characteristics showed that very significant differences exist between different varieties. Significant differences were apparent for cottons of the same staple length.

510. Variation in the Measurable Characters of Cotton Fibres. III. Variation of Maturity among the Different Regions of the Seed Surface. By R. L. N. Iyengar. (*Ind. J. Agr. Sci.*, xi., 6, 1941, p. 866.) The present work is an extension of a previous study by the author, and particular attention is devoted to the variation of maturity in the six different regions of the seed surface: the micropylar end, the portion adjacent to the raphe, right side, left side, back of the seed, and the chalazal end. Fourteen pure strains of Indian cotton formed the material for the investigation, and the results are summed up as follows: The micropylar end contains a very high percentage of mature fibres. The maturity at the chalazal end varies considerably in the different strains, in some being as high as 90 per cent. and in others as low as 30 per cent. The maturity for this region, however, is statistically significantly less than that for the other regions in all cases except one (variety Hl back region). Among the other four regions studied—namely, right and left sides, region near the raphe, and the back of the seed—the differences are generally not considerable, and in only four cottons is the maturity of these regions significantly less than that for the micropylar end. In a test with one variety of the effects of manurial treatment it was found that application of manure to a field with rich soil did not have any appreciable effect on maturity of fibres, whilst in a field with poor soil the supply of better nutriment was accompanied by improved maturity. Differences in the nutrition supplied appeared to have negligible influence on the fibre length, weight per cm. and intrinsic fineness.

[*Cf.* Abstrs. **622**, Vol. XI., **740**, Vol. XVI., **229**, Vol. XIX. of this Review.]

511. Diameter of Fibre in Different Strains of Acala Cotton. By G. N. Stroman. (*J. Agr. Res.*, **64**, 4, 1942, p. 243.) Data were obtained on six different strains of Acala cotton to determine the swollen diameter of fibre in each group length from $1\frac{1}{8}$ to $\frac{1}{8}$ inch in steps of $\frac{1}{8}$. The results showed that the shorter lengths had the largest diameters. Measurements of swollen diameter on the $1\frac{1}{8}$-inch length were made on 12 strains from the advanced test in 1938 and 16 strains in 1940 at the New Mexico station, and significant differences were obtained between strains. In 1938 the strain with the largest diameter was N28-5, with a mean fibre diameter of 23·3μ; strain 1450 had the smallest mean fibre diameter, 20·9μ. The difference between the two strains is 2·4μ, whereas 0·8μ would have been significant. Of all the Acala strains tested in 1940 No. 1517 had the largest mean fibre diameter, 23·57μ. Strain 2815 had the smallest mean fibre diameter, 22·10μ. The difference between these two mean diameters is 1·47, which is significant. This indicates that the cotton breeder could breed strains of cotton with small diameters. A significant difference was found among strains in respect to ribbon width and thickness, and significant positive correlation coefficients between ribbon width and thickness were obtained in two of the four strains tested; significant negative coefficients were obtained between ribbon width and number of convolutions in three of the four strains, while between ribbon thickness and number of convolutions a significant negative correlation was found in only one of the four strains.

512. Occurrence of the Dwarf-Red Character in Upland Cotton. By S. C. McMichael. (*J. Agr. Res.*, **64**, 8, 1942, p. 477.) The mutation of Acala

cotton herein designated as " dwarf-red " originated as a chimera on an otherwise normal green plant. Seeds produced by the chimera were heterozygous for the dwarf-red character. A new type of red-plant colour in Upland cotton is described, and a new type of dwarfing in cotton is discussed which is not recessive in the heterozygous condition. Dwarfing in this type is closely associated with red-plant colour; possibly both expressions are controlled by the same factor. Dwarf-red Acala when crossed with normal green Acala produced an F_2 generation that was intermediate in both colour and plant height between the parental types. The F_2 generation of the cross between dwarf-red Acala and normal green Acala segregated into the 1 : 2 : 1 ratio, inducing a simple monohybrid. Likewise the backcross generations obtained from the crosses made between the F_1 or the heterozygous dwarf-red and the parental types verified the monohybrid condition, both segregating into the 1 : 1 ratio. Indications are that dwarf-red is controlled by a single factor.

513. Versuche über Pflanzen-Hybriden. By G. Mendel. (*Züchter*, 13, 1941, p. 221. From *Pl. Bre. Abs.*, xii., 3, 1942, p. 166.) The original manuscript of Mendel's paper is here reproduced.

514. Asynaptic Plants of Gossypium and their Polyploids. By J. O. Beasley and M. S. Brown. (*Genetics*, 27, 1942, p. 131. From *Pl. Bre. Abs.*, xii., 3, 1942, p. 184.) In the F_2 of American Upland (*G. hirsutum*) × Sea Island (*G. barbadense*) cotton, fertile and sterile plants were found in a ratio of about 15 fertiles : 1 sterile. At first metaphase the fertile plants formed 26 bivalents while different sterile plants averaged 6 to 9 bivalents per nucleus. Doubling the chromosome number in the sterile plants failed to restore normal chromosome pairing and fertility.

515. Hybridization, Cytology, and Polyploidy of Gossypium. By J. O. Beasley. (*Chron. Bot.*, **6**, 1941, p. 394. From *Pl. Bre. Abs.*, xii., 2, 1942, p. 140.) Part of this brief review is concerned with work previously published by the author. From chromosome behaviour at meiosis in hybrids it is concluded that the 13-chromosome species comprise five types. The chromosomes of different types have numerous structural differences. All types are more closely related to the Asiatic type (*G. arboreum* L. and *G. herbaceum* L.) than to each other. The Australian (*G. Sturtii* F. Muell), African (*G. anomalum* Wawra. and Peyr.), and American types (*G. Thurberi* Tod., *G. Davidsoni* Kellogg, etc.) are more closely related to the Asiatic type than is the Arabia-India type *G. Stocksii* M. Mast. Haploid-diploid twins such as frequently occur in *G. barbadense* have been found, though extremely rarely, in *G. hirsutum*. The haploids of the latter have a maximum of 5 bivalents. A number of pure lines have been produced by doubling the chromosomes of haploids.

[*Cf.* Abstrs. **542, 543, 559,** Vol. XVII. of this Review.]

516. Konstanz und Syndeseverhältnisse der Polyploide. By F. Fagerlind. (*Chron. Bot.*, **6**, 1941, p. 320. From *Pl. Bre. Abs.*, xii., 2, 1942, p. 116.) The newly formed interspecific polyploid is generally considered as a type built up by the true addition of the genoms of the original types. This, however, does not hold if the original parents are allogenomic, which probably explains why many tetraploid species vary so much. The result of chromosome doubling in a hybrid between two species is often constant, but segregation is known to occur. An allotetraploid must be constant, but different behaviour is to be expected from interspecific polyploids that are more or less autopolyploid. Here the possibility exists of inter- or intra-specific combinations, and such hybrids are rarely constant. In an interspecific autopolyploid, crossing-over between specifically different chromosomes is possible, and by this means new chromosome types may be

created. As a result of interspecific syndesis, a segmental interchange between the chromosomes may occur leading to the development of secondary types which lack certain chromosome parts necessary to fertility. This may account for some of the observed sterility phenomena.

517. INTERSPECIFIC HYBRIDIZATION AND COLCHICINE-INDUCED POLYPLOIDY IN COTTON. By K. C. Amin. (Surat.) (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, p. 39.) Hybrids obtained between New World and Asiatic cottons were all self-sterile, but fertile progenies had been obtained by backcrossing the F_1 to New World cottons. The backcrosses, which were predominantly American, with only a few characters of the Asiatic parents, showed great variability, and selections from these were under trial.

Colchicine treatment of germinated seeds and the growing shoots of young seedlings gave success in inducing polyploidy. The greater the diversity of the genoms concerned in any particular cross among the diploid cottons, the higher was the fertility of the synthetic tetraploid. The effect of chromosome doubling on economic characters was an increase in the length of staple, and there was also a tendency towards thickening of the fibres, which varied in different cases.

518. DIE COLCHICINMETHODE ZUR ERZEUGUNG POLYPLOIDER PFLANZEN. By B. Györffy. (*Züchter*, 12, 1940, p. 139. From *Pl. Bre. Abs.*, xii., 2, 1942, p. 116.) The literature on the induction of polyploidy by means of colchicine is reviewed and a list is given of the polyploid plants so produced. Arranged according to families, 117 plants are included in the list with the names of the producers.

519. POLYPLOIDS IN COTTON EXPERIMENTALLY PRODUCED BY COLCHICINE TREATMENT. By A. I. Zhurbin. (*C.R. [Doklady] Acad. Sci. U.S.S.R.*, 30, 1941, p. 524. From *Pl. Bre. Abs.*, xii., 2, 1942, p. 141.) A male-sterile but female-fertile amphidiploid shoot was obtained by treating a shoot of the hybrid *Gossypium arboreum* var. *neglectum* W. × *G. Thurberi* Tod. with colchicine. Amphidiploids ($2n=104$) have also been obtained by colchicine treatment of germinating seeds of *G. hirsutum* × *G. barbadense*. These amphidiploids were partly fertile. A triploid plant ($2n=78$) was also obtained, but it is suggested that this was due to the union of an unreduced gamete with a reduced one and not to the colchicine treatment.

FIBRES, YARNS, SPINNING, WEAVING, ETC.

520. CELLULOSE FIBRES: X-RAY STRUCTURE. By E. Plötze. (*Naturwissenschaften*, **29**, 1941, p. 707. From *Summ. Curr. Lit.*, xxii., 13, 1942, p. 304.) X-ray measurements showed that lattice dimensions, orientation and sizes of the crystallites of native fibres of cotton and ramie are about the same as those of low-molecular compounds.

521. CELLULOSE: OXIDATION BY NITROGEN DIOXIDE. (1) By E. C. Yackel and W. O. Kenyon. (2) By C. C. Unruh and W. O. Kenyon. (*J. Amer. Chem. Soc.*, **64**, 1942, pp. 121, 127. From *Summ. Curr. Lit.*, xxii., 7, 1942, p. 165.) A method is described for oxidizing cotton cellulose to a white, fibrous product with great affinity for basic dyes, in which nitrogen dioxide is circulated through the cotton and the nitric oxide formed is allowed to escape through a chilled condenser. The course of the oxidation is judged by determining the carboxyl values of the products. This is done either by shaking the sample with calcium acetate solution and titrating the acetic acid liberated, or by boiling the sample with 12 per cent. hydrochloric acid and collecting the liberated carbon dioxide in a weighed absorption tube. Apparatus is described, and various experiments leading to routine methods for these determinations are also reported. Products

ranging in carboxyl content from 2·8 to 18·6 per cent. are shown in a table that summarizes the results of some 26 runs with various weights of cotton and nitrogen dioxide. Air-dried cotton gave slightly more carboxyl than specially dried cotton. Salts of the oxidized cotton are mentioned. (2) Two other methods for determining the carboxyl content are described, consisting of titrating residual alkali after contact of the sample with dry pyridine or 50 per cent. pyridine mixed with 0·5N caustic soda. Very high copper numbers are recorded for various products. The limiting carboxyl content appears to be about 25 per cent. and residual hydroxyls are shown to be capable of acetylation. Acetyl contents of acetylated oxidized cottons are tabulated. The oxidized cottons yield 9-10 per cent. of formaldehyde in the usual pentosan assay, and the results, taken together, indicate that oxidation by nitrogen dioxide preferentially attacks the primary hydroxyl groups of the cellulose to yield products with combined uronic acid units.

522. Cyanuric and Allyl Cellulose: Properties. Native and Regenerated Cellulose: Differentiation. By R. Haller and A. Heckendorn. (*Helv. Chim. Acta*, 24, 1941, 85E-92E. From *J. Text. Inst.*, June, 1942, A274.) The preparation of cyanuric cellulose by treatment of cotton with alcoholic potash and then with cyanuric chloride in xylene, and the preparation of allyl-cellulose by treatment of cotton with alcoholic potash and then with allyl bromide in xylene, are described, and the products are discussed. The behaviour of the products with swelling agents, iodine reagents, and iodine and sulphuric acid is described, and it is shown that in the cyanuric cellulose only the outer layers are esterified, whereas in allyl-cellulose the entire fibre mass is converted to the ether. This completeness of etherification is attributed to the fact that xylene is a swelling agent for the ether. Both the ester and ether show only small or no affinity for substantive dyes, but it is pointed out that the immunity is relative and dependent on the degree of dispersion of the dyes in aqueous solution. The reduced affinity for substantive dyes is probably due to a change in the surface properties of the fibre as a result of chemical substitution. The desirability of differentiating between cellulose regenerated by saponification of derivatives of native cellulose in which the original fibre structure has been maintained and cellulose regenerated from products in which the original fibre structure has been disturbed—*e.g.*, rayon—is pointed out, and it is suggested that the term "regenerated cellulose" should be reserved for the saponification products of derivatives in which the fibre structure has been maintained. Differences in behaviour with gold chloride solution and with 50° Bé sulphuric acid make it possible to distinguish between native and regenerated cellulose.

523. Cotton: Chemical Treatment and Research. By H. G. Knight. (*Amer. Chem. Soc. News Edn.*, **20**, 1942, p. 581. From *Summ. Curr. Lit.*, xxii., 14, 1942, p. 324.) Scouring, bleaching, dyeing, and finishing processes and the contribution of chemistry to developments in these processes are discussed. The state of the cotton industry in the United States in recent years is reviewed, the need for research is pointed out, and various organizations now undertaking research on cotton are mentioned. Progress made in the study of the physical and chemical properties of cotton fibres, in the development of new and improved cotton products, and in research on chemical finishes is discussed, and directions in which further research is needed are indicated. The work of the Southern Regional Research Laboratory at New Orleans is briefly described.

524. Cotton: Nitration by Nitric Acid Vapour; X-Ray Study. (1) By G. Charpentier and M. Foëx. (2) By M. Foëx. ([1] *C. R. Acad. Sci.*, 211, 1940, p. 468; [2] *Bull. Soc. Chim.*, **8**, 1941, pp. 115, 381, 390. From *Summ. Curr. Lit.*,

xxii., 10, 1942, p. 244.) The course of the nitration of cotton by nitric acid vapour at 35-55° C. and 35-70 mm. was followed by means of X-ray spectrographs. Products with 6·3-13·9 per cent. N were obtained that showed the patterns of both cellulose and trinitrocellulose, the former becoming progressively fainter and the latter stronger with increasing N content.

525. COTTON: VISCOSITY IN DIMETHYLDIBENZYLAMMONIUM HYDROXIDE. By W. W. Russell and L. N. Hood, Jr. (*Ind. Eng. Chem., Anal. Edn.*, 14, 1942, p. 202. From *J. Text. Inst.*, June, 1942, A275.) Apparatus in which it is possible to dissolve cotton in dimethyldibenzylammonium hydroxide in contact with any desired gas is briefly described, and an account is given of a study of the effects of dissolved gas, of stirring in an open system during dissolving, of air and oxygen during dissolving, and of temperature, time, and cellulose concentration, on the viscosity of such solutions. Graphs are given showing the effects of solvent concentration upon viscosity, changes of viscosity with time, and the relation between viscosity and cellulose concentration for unmodified and bleached cotton samples. From the results, conditions favourable for viscosity tests of cellulose quality, with dimethyldibenzylammonium hydroxide as solvent, are drawn up. The desirability of controlling temperature and dissolving time is pointed out. When slightly degraded celluloses (cuprammonium viscosity 25 or greater) are to be analysed the solvent concentration can advantageously be raised to 2·1 to 2·2 N. A cellulose concentration of 0·25 per cent. should give maximum sensitivity in tests on celluloses with cuprammonium viscosities falling between 5 and 43 centipoises. In technical testing a cellulose concentration of 0·35 per cent. may prove most generally useful.

526. COTTON FABRICS: CONSTRUCTION AND WATER RESISTANCE. By P. J. Wood. (*Amer. Dyest. Rpt.*, 31, 1942, p. 6. From *Summ. Curr. Lit.*, xxii., 5, 1942, p. 123.) A study was made of 52 different fabrics, including poplins, plain and print cloths, twills, sateens and sheetings. The fabrics, in 40-50 yd. lengths, were kier boiled, bleached, vat dyed, and cut into three. One part was set aside as a check and the other two were treated with two different types of water-resistant finishes. Width, threads per inch, weight and count and ply of yarns were determined before and after finishing, and the treated fabrics were subjected to immersion, spray, impact penetration, rubbing penetration, hydrostatic pressure, and air permeability tests. The test procedures are briefly described, and the results are given in a table and briefly discussed. An instance of difference in water resistance due to difference in yarn count in similar poplin cloths is pointed out. It was found possible to correlate hydrostatic pressure values with the results of porosity tests and also with the results of impact penetration tests. Air porosity tests may therefore be used to predetermine the properties of the finished material even before it is treated for repellency. Impact penetration and abrasion penetration tests reveal the same property of a treated material and represent the nearest approach, under laboratory practice and control, to evaluation of the suitability of various fabrics for severe weather conditions. It is pointed out that the production of a satisfactory fabric requires a judicious combination of proper construction, suitable permeability to air, and satisfactory water resistance of fibres and yarns.

527. EFFECTIVE MILDEW-RESISTANT TREATMENTS FOR COTTON FABRICS. By M. S. Furry and H. M. Robinson. (*Amer. Dyest. Rpt.*, xxx., 20, 1941, p. 504. From *Rev. App. Mycol.*, xxi., 3, 1942, p. 152.) A list of 13 finishing treatments tested by the authors for the control of mildew (*Chætomium globosum*) on an 8-oz. de-greased and de-sized unbleached cotton duck fabric, strips of which were inoculated with the fungus and incubated for a fortnight. Satisfactory

protection was afforded against the fungus; none of the treatments caused any appreciable loss in strength of the fabric, and a few even seemed to increase it.

528. Cellulose Particles: Formation in Plastids of Cotton Fibre. By W. K. Farr. (*Contrib. Boyce Thompson Inst.*, 12, 1941, p. 181. From *J. Text. Inst.*, April, 1942, A201.) Developing cotton fibres were removed from seeds with extreme care, mounted in filtered juices which had been expressed from other fibres in the same boll, and studied under the microscope. Circular structures of widely varying diameters were faintly but definitely visible in young fibres. They had the appearance of vacuoles filled with clear sap, but closer examination suggested that their contents were more or less dense. When the wall of a fibre was broken with a dissecting needle and the protoplasmic contents allowed to flow out into the mounting medium, the structures were found to be disc-like, not spherical, and their contents not only dense but also granular. All stages of cellulose ring and cellulose particle formation were rapidly identified in the various stages of development of these colourless plastids. The successive stages of ring formation and disintegration reveal the fact that the mechanism of native cellulose particle formation in the colourless plastids of the cotton fibre is essentially similar to the mechanism of mercerized cellulose particle formation in the chloroplast of *Halicystis.* Photomicrographs showing the various stages in the formation of the cellulose particles and their subsequent alignment to form fibrils are given. Photomicrographs showing the formation of starch in plastids of the cotton plant are also given and it is pointed out that the physical aspects of cellulose formation have no apparent points in common with the process of starch formation either in chloroplasts or in colourless plastids in the cotton plant. Within very young plastids, whether colourless or pigmented, no structural features have been observed which will indicate the type of crystalline carbohydrate to be produced. The cells of the leaves, stems, and boll walls of the cotton plant carry on the formation of these two closely related carbohydrates, starch and cellulose, simultaneously, in separate plastids.

529. A Study of Oxygen Absorption and Catalase Production during Growth of *Chætomium globosum* on Cotton Fibre and Yarn. By D. E. Klemme. (*J. Bact.*, xliii., 2, 1942, p. 171. From *Rev. App. Mycol.*, xxi., 6, 1942, p. 288.) At the Bureau of Home Economics, U.S. Dept. of Agriculture, Sea Island cotton fibre and yarn manufactured therefrom were sterilized, inoculated with *Chætomium globosum* (which is stated to have been found on nearly all the samples of awnings, tarpaulins, shock covers, tents, and the like examined in the laboratory of the institution) and incubated for 28 days in a Warburg apparatus. In both materials the daily oxygen consumption reached a maximum at about the 11th day, after which the rate decreased (almost imperceptibly from the 18th to the 28th). Coinciding with the production of perithecia by the fungus, there was a slight fall in the rate of oxygen absorption on yarn between the 5th and 8th days, followed by a renewed increase until the attainment of the peak. The amount of oxygen absorbed by *C. globosum* on the fibre sample was significantly greater than that consumed by the yarn (0·32 milli-equivalents per gm. as compared with 0·21). Corresponding to these differences was a much more extensive output of catalase on the fibre than on the yarn, indicating the superiority of the former as a substratum for the fungus. It was further shown by preliminary experiments that the organisms growing on unsterilized uninoculated samples of Acala cotton fibre consumed a materially larger quantity of oxygen than those present on unbleached cotton fabric; denoting that raw cotton is likely to deteriorate more rapidly than yarn or fabric in a moist atmosphere

530. Cotton Hull Fibre: Catalytic Hydrogenation. By H. R. Henze *et al.* (*J. Org. Chem.*, 7, 1942, p. 48. From *Summ. Curr. Lit.*, xxii., 13, 1942, p. 310.) When a suspension of cotton batting in caustic soda is subjected to a pressure of 75-85 lb. and then hydrogenated in 7 per cent. caustic soda at 250° and 4,800-5,400 lb. pressure, the cellulose is completely dissolved, yielding a colourless homogeneous solution. Cotton hull fibres (300 g.) react with 8·11 mols. of hydrogen, giving 3·31 mols. of gaseous hydrocarbons (chiefly methane), 0·15 mol. of carbon dioxide and 2·39 mols. of acid material. An ether extract of the neutralized solution may be separated by steam distillation into five fractions: (*a*) b_{754} up to 150°, (*b*) b_{33} 76-96°, (*c*) b_5 75-105°, (*d*) b_5 110-114°, (*e*) $b_{3.5}$ 114-146°. Fraction *d* consists of a mixture of γ- or δ-hydroxycaproic acid and its lactone. Fraction *a* contains acetic acid and either propionic or one of the butyric acids.

531. "Cotton Manufacturing." (Published by The Dominion Textile Co., Montreal, Quebec. Price $4.50. Reviewed in *J. Text. Inst.*, March, 1942, p. 41.) This book gives in an essentially practical fashion a general picture of the manufacture of cotton textiles from the raw material to the loom state cloth. It has been compiled by H. F. Mills, General Superintendent of the Dominion Textile Co., Ltd., of Canada, and W. King, Managing Editor of the *Canadian Textile Journal*, with the assistance of several specialists, mostly from the various departments of the Dominion Textile Co.'s organization, and has been published for the use of students from mills of the Company and its subsidiaries. As it now stands, "Cotton Manufacturing" is a standard textbook for the four-year course on this subject sponsored by the Company for its employees. It contains essential data on basic principles in Opening and Picking, Carding, Combing, Drawing, Fly-Frames, Spinning, Winding, Spooling and Warping, Slashing, Weaving, Cloth Room Machinery, Analysis of Fabrics, Designing, and Economics of the cotton industry in Canada. Although its treatment is from a practical rather than a scientific point of view, it is a welcome addition to the present meagre textile literature. Perhaps mainly in its favour is the fact that in regard to machinery and processes it is completely up to date, and, unlike any textbook known to the reviewer, gives American spinning machinery and practice equal prominence with British. The book is well printed and profusely illustrated, though it may be said that there are rather too many photographs of machines, not always well chosen, and that some of the line drawings are far from good; fig. 4 on p. 115 may be cited as an example of this. In spite of the number of pages (429), the volume is compact and well bound, and in fact just the right size for a comprehensive textbook for the student.

532. Cotton, Mercerized Cotton, and Rayon: Moisture Sorption. By V. C. Shaposhnikov. (*Bull. Acad. Sci. U.R.S.S.* (Classe sci. chim.), 1940, p. 427. From *J. Text. Inst.*, March, 1942, A141.) Cotton was purified by extraction with water, alcohol, and ether; the ash was 0·1 per cent. Rayon was extracted with warm water to an ash content of 0·06 per cent. Mercerization was effected by steeping 10 g. of cotton in 600 c.c. of 30° Bé caustic soda, and repeating the operation until less than 1 per cent. of the fibres appeared under the microscope to have escaped mercerization. The uptake of moisture was measured by passing dry or moist air through the fibre in U-tubes. Values of the moisture content of "natural air-dried" samples were cotton 6·8, mercerized cotton 9·78, and rayon 12·61 per cent.; at saturation the corresponding values were 13·69, 20·54, and 24·95 per cent. Complete saturation of air-dry cotton required 167·5 hours, of mercerized cotton 185·5 hours, and of rayon 220 hours. The average moisture content of cotton, silk, flax, wool and four other types of fibres is about 2 per cent. higher than the Turin standards. It is lowest in May and June and highest in

December and January. An attempt has been made to relate the fluctuation to the climate mathematically.

533. Mercerized Cotton: Rate of Hydrolysis. By R. F. Nickerson. (*Ind. Eng. Chem.*, 34, 1942, p. 85. From *J. Text. Inst.*, May, 1942, A237.) The reactivity of mercerized cotton has been measured by determining the rate of evolution of carbon dioxide on boiling a sample (2 gm.) with a mixture (150 ml.) of hydrochloric acid (2·45N) and ferric chloride (0·6M). The samples were prepared by mercerizing folded Egyptian and American yarns after solvent extraction and boiling them in a 2 per cent. caustic soda in the absence of air. After allowing for an "induction period" which is determined from parallel experiments on glucose, the amounts of carbon dioxide evolved are found to be linearly related to a power of the time over a considerable period. The slope for mercerized cotton is steeper than for unmercerized, and mercerization under tension gives slightly less steep curves than mercerization without tension. Velocity constants are calculated from the linear portions of the curves. With the constants for unmercerized cotton as unity they provide "mercerization ratios" that agree with those calculated by other methods, such as moisture regain determinations. The bearing of the work on the structure of cotton cellulose is discussed.

534. Cotton Mill: Cleaning. By E. Hard. (*Cotton*, U.S., **105**, Nos. 9, 10, 12; **106**, No. 1, 1941. From *J. Text. Inst.*, April, 1942, A170.) Practical hints are given on systematic mill cleaning, and a number of simple appliances for securing tidiness and for sweeping and dusting are described.

535. Cotton: Effects of Oiling. (1) By B. I. Pestov. (2) By G. A. Shumilov. (*Khlopchatobumazhnaya Prom.*, **9**, 5, 1939, p. 26. From *J. Text. Inst.*, April, 1942, A170.) (1) Cotton was oiled at the scutcher with 0·37 per cent. of "Verol SK-2" (density 0·866, flash-point 141° C., Engler viscosity 1·71, mechanical impurities 0·01 per cent., water 0·1 per cent., SO_3 0·001 per cent., feeble basic reaction, Al present). Carding was hindered but breaks in spinning were fewer. (2) Dry and moist cotton, differing by 2-3 per cent. in regain, do not require different oiling treatments. Oiling with 0·1 per cent. of transformer oil or 0·1 or 0·3 per cent. of Verol gave good results. The length and regain of the spun yarn were not affected by oiling, but the quality and breaking length were impaired.

536. Cotton Plant: Recovery of Oil. By E. L. Powell and F. K. Cameron. (*Ind. Eng. Chem.*, **34**, 1942, p. 358. From *Summ. Curr. Lit.*, xxii., 9, 1942, p. 219.) The recovery of oil from whole cotton by solvent extraction is discussed, the term "whole cotton" being used to connote plants grown under forcing conditions of close planting and harvested by mowing the whole plant after it has attained a maximum content of oil and cellulose. Objectionable colouring matter in the stems and cusps can be removed from the whole cotton by aqueous solutions of sulphides and sulphites. After such treatment, organic solvents extract the oil in a form which is easily bleached by standard adsorbents. A refined oil can be obtained which meets standard specifications and the requirements of the American market.

537. Cotton Plant and Wood: Cellulose Content. By W. H. W. Chen and F. K. Cameron. (*Ind. Eng. Chem.*, 34, 1942, p. 224. From *J. Text. Inst.*, May, 1942, A210.) Cellulose analyses are reported for parts of the cotton plant and for various timbers of the South-eastern States. The cotton plant is composed roughly of lint 24 (24), seed 36 (5·6), cusps 20 (8), and stems 20 (8) per cent.; the "total cellulose" of the plant is distributed as shown by the percentages in parentheses. The α-cellulose content of the total cellulose is higher in the cotton plant than in the timbers.

538. COTTON PULPS: MODIFICATION BY OXIDIZING AND HYDROLYSING AGENTS. By D. M. Musser and H. C. Engel. (*Paper Tr. J.*, 114, TAPPI, 1942, p. 173. From *J. Text. Inst.*, July, 1942, A343.) A report of a study of some papermaking properties of cotton pulps degraded by treatment with aqueous permanganate, neutral hypochlorite, and hydrochloric acid solutions. Reduction of the cuprammonium specific viscosity of cottonseed hull fibre to a value below 10 facilitates beating. Linters and lint cotton would probably behave similarly. With pulps degraded to the same cuprammonium viscosity, the physical properties of handsheets appear to be affected less by oxidizing agents than by acids. These effects are discussed in relation to fibre structure.

[*Cf.* Abstr. **268**, Vol. XIX. of this Review.]

539. INTERNAL RECONSTRUCTION IN COTTON SPINNING. By R. H. A. (*Text. Mfr.*, lxviii., 810, 812, 1942, pp. 219, 320.) Part I stresses the urgent necessity for improvements in processing efficiency and conditions of working in cotton mills in order that Lancashire may maintain and expand its export trade in the post-war period. Two recent improvements in the mixing and blowing rooms are dealt with in some detail: stack mixing and single process lapping. Part II discusses suggested schemes for conversions of plant in a typical case.

540. SPINNING MILL LABOUR-SAVING DEVICES. By B. Robinson. (*Text. Wkly.*, 29, 1942, p. 470. From *Summ. Curr. Lit.*, xxii., 9, 1942, p. 199.) A summary of a lecture on recent machine developments that offer the prospect of reducing the number of processes and operatives in cotton spinning. Special attention is paid to the contributions of the Shirley Institute, such as the Pneuopener, the Lint Recoverer, and " short process " spinning.

541. SPINNING PROBLEMS: DISCUSSION. Southern Textile Association. (*Cotton*, U.S., **105**, 12, 1941, p. 88. From *Summ. Curr. Lit.*, xxii., 5, 1942, p. 113.) A report of a discussion of the effects of increasing card cylinder speeds, methods of introducing new employees to their work, training classes for employees, improvements in yard per yard evenness produced by blending reserves on scutchers, relative humidity in high draft spinning, and the inspection of new bobbins and quills. Test results showing increases in production and in yarn strength as a result of increasing card cylinder speeds from 172 r.p.m. to 196 r.p.m. and from 165 r.p.m. to 192 r.p.m. are quoted. It was pointed out that a lower relative humidity is required with high draft than with regular roving. Methods of controlling humidity were briefly discussed and the need for air conditioning was stressed. The use of a machine running at a speed of 1,100 r.p.m. for testing bobbins for balance, and also of gauges and a jig for testing the size of bobbins, was reported.

542. TEXTILE EDUCATION AND RECRUITMENT. (*Text. Wkly.*, **29**, 1942, pp. 666, 668, 698, 700, 707. From *Summ. Curr. Lit.*, xxii., 13, 1942, p. 317.) A report is given of a Conference on " The Future of Technical Education for the Textile Industry " held on June 6 at the Oldham Technical College. The history of the industry was briefly reviewed and the present unsatisfactory conditions discussed by A. C. C. Robertson, who suggested that cotton operatives should be engaged on a yearly basis of payment for all jobs in the mill which have well-defined operation. J. Millward pointed out that, given post-war reconstruction based on the reopening of world trade by lasting coöperation, the cotton industry could confidently look forward to stability, exports, regular employment, reasonable working conditions and wages commensurate with those in other industries, which factors should ensure a steady flow of new entrants to the mills. He also pointed out that, in order to make the best type of workman, youths should enter the spinning trade at a reasonably early age

(below sixteen). Mr. E. Raymond Streat advised a break with the past and a planned policy of production and progress based on new, bold lines. He recommended the modernizing of the industry and pointed out that the Cotton Board believes that the industry can be made prosperous by a policy based on a wise system of price management, coupled with sound Government trade policy at home and abroad, and with schemes of trade promotion and technical progress on the basis of constant research. He stressed the need for scientifically trained men, and classified young people entering the mills into three groups: (1) young people who will be operatives and get the required training in the mills; (2) ambitious young operatives who intend to equip themselves as overlookers, foremen, mill managers, etc., who will require a background of sound technical education; and (3) the fully trained scientist—the textile technologist proper—who should have a university degree. Discussing the education of these groups, Mr. Streat suggested that there may be too many so-called technical institutions in Lancashire, and that every technical school or institution should be part of a county-wide scheme, playing its allotted part. Other speakers suggested promotion based on technical education and real merit rather than on seniority and name, coöperative control in the industry, good equipment in technical schools, and travelling scholarships.

543. The Microscope in Textile Analysis. By W. O. Holme and F. J. Munoz. (*Rayon Text. Mo.*, 22, Nos. 1, 2, 1941. From *Exp. Sta. Rec.*, **86**, 2, 1942, p. 280.) The many uses of the microscope in the textile laboratory are noted, and the discussion is concerned with the accessories required; the minimum, optimum, and optional equipment; the preparation of specimens; the proper instrument technique; the measurement of diameter; the advantages of projection; and projecting arrangements.

544. Maintaining Constant Humidity. Automatic Laboratory Device for Use in a Closed Chamber. By C. Nanjundayya and N. Ahmad. (*Text. Wkly.*, 23/1/42. From *Cott. Lit.*, March, 1942, p. 96.) The device is stated to be specially useful in a laboratory either for conditioning samples at known humidity or for taking measurements on samples which require to be kept in an atmosphere of constant humidity over long periods.

545. Cotton Yarns: Testing. By D. F. Kapadia. (*Ind. Text. J.*, 52, 1942, p. 109. From *Summ. Curr. Litt.*, xxii., 16/17, 1942, p. 383.) Previous work is reviewed and a comparative study is made of lea, single-thread, and ballistic testing methods. The lea test is shown to be of an inferior order compared to the other two, and it is pointed out that there is not much ground for regarding the single-thread test as being liable to considerable sampling error, if its measurements are expressed as count-strength product and a correct sampling procedure is employed. The ballistic test is shown to be the most significant. For the purpose of testing with reference to a spinning test it is suggested that tests should be made on ten bobbins. The total length of yarn on each bobbin should be considered as made up of five parts and from each part, subject to a random order within it, samples should be drawn for one lea, one ballistic and ten single-thread tests. In this way a reliable estimate made up of fifty lea, single-thread, and ballistic count-strength measurements will be obtained. It is shown that there is no advantage in calculating the statistical values of such quantities as (*a*) yarn-strength irregularity percentage, (*b*) weakness percentage of single-thread tests, and (*c*) spinning breaks, without a knowledge of standard magnitudes of these quantities to guide judgments of yarn strength and quality. Limiting magnitudes of these quantities are derived and explained with reference to spinnings in different standard counts and to spinning values. A laboratory

spinning test technique is described which is capable of giving spinning values of cottons from spinnings in two standard counts. Results obtained with Indian cottons of different varieties and seasons are discussed.

546. COTTON YARNS: LOAD TO STRAIGHTEN. By H. J. Ball. (*Text. World*, **92**, 3, 1942, p. 86. From *Summ. Curr. Lit.*, xxii., 11, 1942, p. 259.) A method of determining the load necessary to straighten, but not stretch, a single cotton yarn which has been unwound from a bobbin, is described.

547. A THEORETICAL APPROACH TO THE PROBLEM OF YARN STRENGTH. By R. R. Sullivan. (*J. App. Phys.*, March, 1942. From *Cott. Lit.*, April, 1942, p. 136.) "An idealized yarn, composed of fibres with specified properties, is treated analytically with the aim of determining the yarn strength at any degree of twist. The results are presented in the form of equations and curves which relate the yarn strength to the fibre properties and the degree of twist. Two cases are studied: (1) all fibres alike; (2) fibre properties variable from fibre to fibre. In the latter case the mathematical expectation of the yarn strength at any yarn cross-section is obtained. It is found that the optimum twist multiplier is largely determined by the fibre length, fibre fineness, and coefficient of friction, whereas the maximum yarn strength (corresponding to the optimum twist multiplier) is more strongly dependent upon the intrinsic fibre strength than upon the other fibre properties studied."

548. COTTON YARNS AND CORD: TREATMENT TO IMPROVE STRENGTH. United States Rubber Co. (New York.) (B.P. 545,716 of 3/2/41: 9/6/42. From *Summ. Curr. Lit.*, xxii., 15, 1942, p. 351.) A process for improving the tensile strength of yarn or cord composed of cotton fibres comprises subjecting the natural waxes on the cotton fibres to treatment with a water-soluble wax-emulsifying compound which has a retaining action on the natural waxes, permitting the resulting compound to remain on the cotton, and stretching the yarn or cord to an extent just short of the breaking point. The wax-emulsifying compound is preferably selected from the class consisting of alkali metal salts of alkylated aromatic or hydro-aromatic compounds containing functional acidic groups which render them soluble in aqueous alkali. The treatment may be applied to tyre cords which are subsequently treated with rubber latex.

TRADE, PRICES, NEW USES, ETC.

549. THE WORLD DEMANDS A SOUND COTTON POLICY. By A. B. Cox. (*Text. Business Rev.*, March, 1942. From *Cott. Lit.*, May, 1942, p. 154.) About 95 per cent. of the world's cotton is normally grown in six countries—United States, India, Russia, China, Brazil and Egypt—whereas about 70 per cent. of the world's 147,000,000 cotton-spinning spindles are in Great Britain, Germany, France, Italy, and other European countries, and Japan, which all together grow less than 1 per cent. of their raw-cotton requirements. The tremendous significance of the problems of international relations caused by this separation of cotton manufacturing from cotton growing becomes evident when it is realized that the trade in raw cotton, semi-finished, and finished cotton goods together constitutes the largest unit in world trade.

550. COTTON STATISTICS. By J. A. Todd. (*Text. Manufr.*, lxviii., 1942, Nos. 808, 809.) The thirtieth paper of this series (April, 1942) discusses important developments during March affecting the raw cotton section of the Lancashire cotton industry. The cotton position in the United States, India, Egypt and South America is also discussed. Tables are included giving Cotton Prices in New York and Bombay weekly from September 6, 1941, to March 28, 1942, and

the Monthly Consumption of all cottons in the United States from August to February for the seasons 1939-40 to 1941-42.

The next article (May) deals briefly with the process of rationalization among raw-cotton merchanting firms. Developments in the United States, India, Egypt, South America, and the purchase of the African cotton crops by the British Government, are discussed. The two tables included give the Cotton Prices in New York and Bombay weekly from September 6 to April 25, and the Government Forecasts of the Indian crop from August to April for the seasons 1937-38 to 1941-42 inclusive.

551. COTTON SUPPLY AND MARKETS. By J. A. Todd. (*Text. Mnfr.*, lxviii., 1942, June, and subsequent numbers.) This is a new series of articles giving month by month a review of the cotton situation at home, and in the United States, South America, India, and Egypt. The most recent article (September) states that in the home section releases of long staples—Egyptian, Sudan, and East African—continue in excess of the restricted demand from fine spinners, and a good proportion of recent arrivals have been delivered into the Control's reserve stores. War and shipping uncertainties make it difficult to predict the character of raw cotton imports during the present season, but it would seem reasonable to anticipate a total import of rather more than 2,000,000 running bales. Prospects are that almost the whole of the West African, French Equatorial, and Belgian Congo cotton crops will again be shipped to the United Kingdom. The "Care and Maintenance" scheme drawn up by the directors of the Liverpool and Manchester Cotton Associations has received Government approval and is to be put into operation with a minimum of delay. Under the scheme, firms and group units employed as Controller's handling agents will pay commissions and fees received from the Control into a central fund for redistribution to the raw-cotton trade as a whole. By this means it is hoped to maintain in being the basic structure of the cotton market for ultimate post-war reconstruction. In contrast to the situation ruling a few months ago yarn production in Lancashire is now running in excess of manufacturers' needs. Business in the Manchester yarn and cloth markets during the month of August has been moderately active. Export trade has been largely confined to the filling of the West African allocation for the current quarter and to a few Government-sponsored orders for the Dominions. . . . Prospects are that production of both yarn and cloth in Lancashire will be fairly well stabilized at around the current level through the autumn and winter months.

United States.—Price fluctuations in the American cotton markets during August have been narrow and indecisive. In Washington farm legislation has been kept in the background mainly for domestic political reasons. An ideal growing season, coupled with liberal fertilization of the best cotton land, gives every prospect of record high yields of good-quality cotton. July consumption of all kinds of cotton by the U.S. mills was officially returned at 995,000 bales, bringing the total for the 1941-42 season to 11,172,000 bales, of which approximately 11,000,000 bales were American cotton. Total consumption during the present season is generally expected to be at least 12,000,000 bales.

Egypt.—The current cotton crop is estimated between 400,000 and 500,000 running bales, compared with an approximate output of 1,150,000 bales in 1941. Most of the export of around 650,000 bales went to Great Britain, though fair shipments were made to India and the United States. Stocks in Egypt on August 1 last totalled about 1,300,000 bales, the great part of which was held by the Anglo-Egyptian Buying Commission.

India.—Domestic politics have overshadowed the Bombay cotton markets during the past months, prices breaking by Rs. 40 per candy when the outbreak of

civil disobedience became imminent. Monsoon and crop news have continued generally favourable. The total acreage under cotton is estimated at 15-20 per cent. less than last year owing to much reduced sowings of short-stapled varieties.

South America.—Estimates of the 1941-42 Argentine crop are now given at 350,000 bales as a result of a favourable harvesting season. Establishment of higher Government loan rates and a reduction in estimates of the current Brazil crop to 1,350,000 bales have stimulated a further advance in São Paulo cotton prices, the quotation for type 5 rising to 66 milreis per 15 kilos. About half the 1941-42 Peruvian crop of around 280,000 running bales has already been marketed through normal commercial channels. Prices in the Lima market advanced following a Government decree providing for a 30 per cent. reduction in the 1942-43 cotton acreage.

552. Research in U.S.A. to Increase the Use of Cotton—a Symposium. (*J. Home Econ.*, **32**, 7, 1940, p. 443. From *Exp. Sta. Rec.*, **86**, 4, 1942, p. 571.) The following papers are presented: Cotton Fabric Research in the Bureau of Home Economics (R. O'Brien); Domestic Utilization of Cotton in Relation to Economic Conditions in the South (R. J. Cheatham); The Importance of Chemical Finishing in Increasing the Consumption of Cotton Textiles (W. M. Scott).

553. Low-Grade Cotton: Use for Paper. By E. O. Reed. (*Amer. Dyest. Rpt.*, 31, 1942, p. 24. From *J. Text. Inst.*, April, 1942, A180.) Cotton by-products such as hull-shavings and the waste from ginning, carding and other cotton-cleaning operations can be made suitable for the production of fine bond and writing papers by boiling with sodium chlorite and then bleaching. Paper equal to the best from cotton rags has been obtained in this way.

554. Sewing Cotton: Use for Stitching Wounds. By W. H. Meade and C. H. Long. (*Sci.*, **95**, No. 2462, Suppl. 12. From *J. Text. Inst.*, June, 1942, A259.) Ordinary sewing cotton can replace silk in sewing up all types of wounds requiring interrupted stitches. During a period of eighteen months cotton has been used for this purpose in approximately 1,800 cases at Charity Hospital, New Orleans. Cotton was tolerated better by body tissues than silk, and can be used more safely in the presence of infection. Dry, unsterilized cotton has a lower tensile strength, count for count, than catgut, silk or linen, but is less weakened than these by sterilization.

555. Cotton Thread: Application in Surgery. By H. Taubenschlag. (*Bol. Mens.* No. 75, *Junta Nac. del Algodon*, Buenos Aires, 1941, p. 601. From *J. Text. Inst.*, April, 1942, A171.) Disadvantages of catgut for use in surgery and experiences with other materials are discussed. Tests have shown that silk and cotton threads produce less œdema and inflammation than catgut and linen thread, and that these effects disappear most quickly when cotton thread is used. Satisfactory results with sterilized cotton thread in various operations are reported. The use of fine thread and needles is recommended.

ADDENDA.

556. Uganda. Conference on Rural Betterment. (*Rpt. and Proc. of Conf. on Rural Betterment*, 1941, recently received.) This Conference, held from May 7 to 10, 1941, was arranged to enable those working on rural betterment to have an opportunity of discussing the various aspects of the work and to consider the many practical problems that have arisen from time to time. Officers of the Provincial Administration as well as of the Agricultural, Forestry, Medical and Veterinary Departments attended the Conference.

The Director of Agriculture, in his opening address on "General Problems concerning Rural Betterment," described briefly the work that had been done

in connection with rural reconstruction. There had been great developments in recent years in the work of the technical departments, but difficulty was experienced in applying the results to the progress of the rural African communities. The need was pointed out for a class of trained Africans of proved character, integrity, and ability to lead others, who could pass on to the rural communities the simple lessons on such matters as strip cropping, diagnosis of cattle disease, prevention of overcutting of timber supplies, better housing, improvement of village water supplies, etc. The Conference agreed that this class of rural worker was desirable, and the question of the recruitment and training of Africans considered suitable for the purpose, who might be given some such title as Rural Assistant, was fully discussed.

Several other useful papers were read and discussed, and abstracts of some of them are given below.

In closing the Conference the Director of Agriculture expressed the hope that it would be possible to organize further Conferences, possibly on an annual basis, since the interdepartmental discussions were of very great value to all concerned.

557. Problems of Rural Reconstruction in Teso. By A. L. Stephens. (*Rpt. and Proc. of Conf. on Rural Betterment*, Uganda, 1941, p. 4.) A five-year plan has been instituted to introduce strip-cropping with permanent grass strips on the contours. The Teso native recognizes the benefit of manuring but always raises the objection of the labour involved, especially as the cattle remain relatively concentrated while cultivation has been dispersed. Any changes must be gradual and evolve as naturally as possible as developments of the previous methods.

558. Extension Propaganda. By T. E. Hayes. (*Rpt. and Proc. of Conf. on Rural Betterment*, p. 7.) Deals with the organization and methods of rural propaganda addressed to Uganda peasant farmers.

559. Aspects of the Maintenance of Fertility in Overcrowded Areas. By C. E. J. Biggs. (*Rpt. and Proc. of Conf. on Rural Betterment*, p. 12.) Deals mainly with areas in which holdings are in many cases not large enough to allow of land under annual crops being rested three years under grass. The worst areas are being subjected to overcropping with cotton and maize, which is now inducing sheet erosion in a soil which was originally highly fertile and resistant to erosion. Recourse may have to be made to bunds planted with grass to slow down erosion until research has provided a means of restoring fertility. When a minimum standard of fertility has been reached cotton will go on producing a crop indefinitely. Shorter periods under grass may be found effective, and mineral nutrients might be supplied by the ash from seed burnt at the ginneries. Stall feeding of cattle on elephant grass for the production of manure should be tried.

560. Gully Erosion. By G. B. Masefield. (*Rpt. and Proc. of Conf. on Rural Betterment*, p. 18.) Almost all gully erosion in Buganda arises from run-off from roofs and bare compounds, and from boundary ditches, footpaths, and roads. Methods are discussed of arresting the operation of these causes, and of dealing with gullies already formed by the use of elephant grass or earth dams planted with grass.

561. Practical Problems in Connection with Strip Cropping. By R. K. Kerkham. (*Rpt. and Proc. of Conf. on Rural Betterment*, p. 15.) Describes the system of strip cropping laid out at the Serere Farm and some of the difficulties which would be involved in its wider adoption. The most serious appears to arise in the grazing of cattle, which might be met, at the expense of some loss of

land, by live hedges. An objection continually raised by natives is the greater facility offered for theft and the depredations of animals.

562. ANIMAL HUSBANDRY. By C. F. Clay. (*Rpt. and Proc. of Conf. on Rural Betterment*, p. 20.) Deals with the place of livestock in native agriculture in Uganda under the headings: breeding, grassland management, supplementary feeding, housing, and the utilization of manure. The conclusion was reached after discussion by the Conference that improvement in the management of stock must precede advances in breeding. There is plenty of room for improvement by selection, but the disease factor is of such prime importance that this should be carried out under veterinary supervision. Stall feeding in Buganda for manure and meat should be investigated.

ERRATUM.

REPORT OF THE AGRICULTURAL RESEARCH STATION, SUDAN, 1937-38, Vol. XVIII., Abstr. **297**, p. 85. The sentence beginning on line 14 is incorrect and should read as follows: "In rotation experiments the inclusion of dura in a rotation had a depressing effect on subsequent cotton yields. The best yields were obtained with a cotton-lubia (*Dolichos*)-fallow rotation."

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THE
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VOL. XX. JUNE, 1943. No. 1

ABSTRACTS OF CURRENT LITERATURE

COTTON IN INDIA.

1. SUPPLY AND DISTRIBUTION OF THE VARIOUS TYPES OF INDIAN COTTON DURING THE SEASON 1940-41. (*Stat. Bull. No.* 11. Ind. Cent. Cott. Comm., 1942. Price 12 annas.) Gives statistical and other information concerning: area under improved varieties of cotton from 1938-39 to 1940-41; supply and distribution of the various types of Indian cotton during the twelve months commencing September 1, 1939 and 1940; the Indian cotton crop of 1940-41 classified according to staple length; stocks of Indian cotton on January 31, 1942, held by the mills and the trade in Madras Province; exports, etc. Various appendices deal with: Bombay average prices for Broach, Oomras, and Bengals, 1926-27 to 1940-41; Indian cotton crop classified according to staple length, 1926-27 to 1940-41; stocks of Indian raw cotton held by the mills and the trade in India, 1937 to 1941; receipts at mills in India of raw cotton classified by varieties, 1931-32 to 1940-41; consumption of Indian cotton in Indian mills, 1931-32 to 1940-41; exports of Indian cotton and prices, 1926-27 to 1940-41.

2. INDIAN COTTON: REVIEW OF THE 1941-42 SEASON. We have received from Messrs. Chunilal Mehta and Co., Bombay, a copy of the *Indian Cotton Review* for the 1941-42 season. The area under cotton totalled 23,547,000 acres, compared with 23,286,000 acres for the previous season. Production was 6,025,000 bales, against the 1940-41 total of 6,081,000 bales. Yield per acre was 102 lb. compared with 104 lb. for the previous season. Imports of foreign cottons showed a decline of 15 per cent. over 1940-41. Exports of Indian raw cotton, owing to the closing of the Far Eastern markets, were provisionally estimated at around 900,000 bales, a decline of over 55 per cent. from the previous season's total of 2,012,000 bales. On the other hand, due to the absence of foreign competition, exports of Indian cotton piecegoods during the nine months September, 1941, to May, 1942, totalled 736 million yards, compared with 523 million yards for the whole of the 1940-41 season, this constituting an all-time record in the Indian textile industry. An interesting section of the *Review*, under the title of " Looking Ahead," deals with the prospective position of Indian cotton during the season 1942-43. Various statistical tables included in the report are concerned with cotton acreage and yield; world supply, distribution and stocks of Indian cotton; consumption by mills in India; cotton prices in Bombay; etc.

3. REPORT ON THE STAPLE LENGTH OF THE INDIAN COTTON CROP OF THE 1941-42 SEASON. (*Stat. Leaflt. No.* 1, 1942. Ind. Cent. Cott. Comm.) The crop of 1941-42 is estimated by the Government to produce in bales of 400 lb.:

Long staple, over 1 inch	161,000
Medium staple, $\frac{7}{8}$ to 1 inch	2,551,000
Short staple, below $\frac{7}{8}$ inch	3,313,000
Grand total	6,025,000

4. Indian Government to Amend the Cotton Ginning Act. (*Cotton*, M/c, 27/11/42.) A draft Bill to amend the Cotton Ginning and Pressing Factories Act, 1925, has been published in the *Bombay Government Gazette.* The Bill provides for the establishment of rate-fixing committees in local areas and for punishment with fines extending to Rs. 500 for charging rates for ginning and pressing cotton in excess of those fixed by the committees.

5. Indian Cotton: Marketing. By R. G. Saraiya. (*Ind. Text. J.*, **52**, 1942, p. 295. From *Summ. Curr. Lit.*, xxii., **21**, 1942, p. 490.) The principal features of the Indian Cotton Contract, which was adopted in July, 1942, are discussed and compared with the provisions of the old Broach Contract. The basis of the new contract is Fine M.G. Jarilla cotton, staple $\frac{3}{4}$ inch.

6. Indian Central Cotton Committee: Report of the Technological Laboratory, 1941-42. (Ind. Cent. Cott. Comm., 1942. Price 6 annas.) A report of continued progress in the various sections of the Laboratory. The total number of samples received for test reached the record figure of 2,100, compared with 1,800 the previous season, which also constituted a record. Samples received for test at the Testing House numbered 1,445, against 1,120 last year. The Spinning Laboratory, Technological Research, Fibre Testing, and Moisture Testing sections were all occupied in important work throughout the year. Work was continued in the new Ginning section, and the first series of experiments on the pre-cleaning of Indian seed cottons on different machines, and ginning with different speeds and settings in the saw and roller gins, was completed.

7. Spinning Test Reports on Indian Cottons, 1941-42. By N. Ahmad. (*Tech. Circs.*, Nos. 503-13, 515-21, 523-26, 528-9. Ind. Cent. Cott. Comm.) The circulars contain the report of the Standards Committee and spinning test results for LSS, Sind Sudhar, Punjab-American 289F/43, Khandesh, Verum, Jayawant, Upland, Farm Westerns, Navsari, and Broach cottons; the grader's report and spinning test reults for Farm Westerns, Broach, Westerns, Hubli Jayawant, Bailhongal, Miraj, Surat, Kadi, Karunganni, Punjab-American 4F, and Tinnevelly cottons; report of the Special Appeal Committee for African cottons and spinning test results for A.R. Kampala, A.R. Busoga, and A.R. Jinja cottons.

8. Technological Reports on Indian Cottons, 1941-42. By N. Ahmad, (*Tech. Circs.*, Nos. 514, 522, 527. Ind. Cent. Cott. Comm.) The particulars given include agricultural details, grader's report, fibre particulars, spinning test results, remarks and conclusions.

Jayawant (*Kumpta*).—Yarns slightly neppy up to 1936-37, but have since shown improvement in this respect. Suitable for 41's warp.

Gaorani 6.—Yarns practically free of neps. Suitable for 35's warp.

289*F*/*K*25.—Yarns slightly neppy. Suitable for 41's warp.

9. Technological Research on Cotton in India. By N. Ahmad. (Ind. Cent. Cott. Comm., 1942. Price Rs. 2-8-0.) A very interesting account of the work done at the Indian Central Cotton Committee's Technological Laboratory from its inception in 1924 up to 1941. The various sections of the report deal with: The history and objects of the Laboratory; fibre tests and research on cotton fibre and yarn; spinning tests and technological research; moisture content of Indian cottons, and allied problems; exhibits and exhibitions. A useful summary is included of the work carried out during the period under review,

and the success achieved. A list is given of the 89 technical bulletins and leaflets and 494 technical circulars published by the Laboratory during the course of its existence, and illustrations of the various departments are also included.

10. Indian Cotton Textiles: Organization for War Supplies. (*Ind. Text. J.*, **53**, 1942, p. 4. From *Summ. Curr. Lit.*, xxiii., **2**, 1943, p. 51.) It is pointed out that the Indian cotton industry, comprising about 10,000,000 spindles and 200,000 power looms, in addition to a very large number of handlooms, is playing a leading part in providing not only for India's own armies, but also those of the Empire and the Allies operating in the eastern theatre of war. Conditions of supply and demand during the early days of the war are reviewed, and reasons for the failure of the tender system are explained. The present system of securing war supplies for the Government by the co-operative effort of the accredited representatives of the industry forming the Cotton Textile Advisory Panel and the executive organization of the Government represented by the Cotton Textile Directorate, and the Defence authorities represented by the Controller-General of Inspection and his organizations, is described.

11. Indian Cotton Cloth. (*Man. Guar.*, 6/1/43.) Information from a reliable source in India is to the effect that cotton cloth is being given all the warmth of wool as a result of a series of experiments conducted by a well-known Indian scientist on behalf of the Indian Army. In order to impart to the new cloth the thermal qualities of wool it is treated with the seeds of two trees. The finished product is said to be warm, durable, and soft.

12. Cotton Mills and Handlooms: A Plea for Co-operation. By Rao Bahadur K. S. Rao. (*Ind. Text. J.*, vol. liii., January, 1943, p. 101.) The handloom and the power loom should, in a vast country like India, be complementary to each other, but for various reasons there have been very serious maladjustments in the relations between them. Many have endeavoured to solve the problem. Some have suggested that, in order to eliminate the competition, handlooms should specialize in weaving only artistic fabrics, which mills are incapable of reproducing due to intricacy of design and smallness of demand. But the purchasing capacity of an average Indian consumer is too low to permit him to indulge in luxury articles. Others have advocated the weaving of only handspun yarn by the handloom weavers. This, too, is not a practical proposition because the cost of producing *khaddar* is heavy and the quality is so inferior, as compared with cloth of mill-spun yarn, that the demand for it is limited. In this paper the author comes to the conclusion that co-operation between the two industries is the only way out of the present position, and he has tried to show how this co-operation may be brought about.

13. The Alkali Soil Problem and Reclamation Methods in India and Ceylon. By A. W. R. Joachim. (*Trop. Agriculturist*, xcvii., **4**, October, 1941, p. 202.) The author indicates briefly the general position in regard to alkali soils in India, and discusses at greater length the following methods adopted for the reclamation of these soils in that country. *Mechanical:* Under which are included (i) drainage, (ii) leaching with water. *Agronomic :* These include (i) the growing of suitable crops in suitable rotations, (ii) the cultivation of salt-resistant varieties of such crops, (iii) green manuring, (iv) the application of farmyard manure, compost and other bulky organic residues. *Chemical :* Of the chemicals used for correcting soil alkalinity, one type—viz., sulphate of ammonia, molasses and sugar-cane press mud—is utilized, at any rate occasionally, as fertilizer for crops. The other type—viz., gypsum, sulphur, alum and iron sulphate—is rarely, if ever, used for this purpose.

The alkali problem in irrigated areas in Ceylon and its control, with particular

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Grand total	6,025,000

4. INDIAN GOVERNMENT TO AMEND THE COTTON GINNING ACT. (*Cotton*, M/c, 27/11/42.) A draft Bill to amend the Cotton Ginning and Pressing Factories Act, 1925, has been published in the *Bombay Government Gazette*. The Bill provides for the establishment of rate-fixing committees in local areas and for punishment with fines extending to Rs. 500 for charging rates for ginning and pressing cotton in excess of those fixed by the committees.

5. INDIAN COTTON: MARKETING. By R. G. Saraiya. (*Ind. Text. J.*, **52**, 1942, p. 295. From *Summ. Curr. Lit.*, xxii., **21**, 1942, p. 490.) The principal features of the Indian Cotton Contract, which was adopted in July, 1942, are discussed and compared with the provisions of the old Broach Contract. The basis of the new contract is Fine M.G. Jarilla cotton, staple $\frac{3}{4}$ inch.

6. INDIAN CENTRAL COTTON COMMITTEE: REPORT OF THE TECHNOLOGICAL LABORATORY, 1941-42. (Ind. Cent. Cott. Comm., 1942. Price 6 annas.) A report of continued progress in the various sections of the Laboratory. The total number of samples received for test reached the record figure of 2,100, compared with 1,800 the previous season, which also constituted a record. Samples received for test at the Testing House numbered 1,445, against 1,120 last year. The Spinning Laboratory, Technological Research, Fibre Testing, and Moisture Testing sections were all occupied in important work throughout the year. Work was continued in the new Ginning section, and the first series of experiments on the pre-cleaning of Indian seed cottons on different machines, and ginning with different speeds and settings in the saw and roller gins, was completed.

7. SPINNING TEST REPORTS ON INDIAN COTTONS, 1941-42. By N. Ahmad. (*Tech. Circs.*, Nos. 503-13, 515-21, 523-26, 528-9. Ind. Cent. Cott. Comm.) The circulars contain the report of the Standards Committee and spinning test results for LSS, Sind Sudhar, Punjab-American 289F/43, Khandesh, Verum, Jayawant, Upland, Farm Westerns, Navsari, and Broach cottons; the grader's report and spinning test reults for Farm Westerns, Broach, Westerns, Hubli Jayawant, Bailhongal, Miraj, Surat, Kadi, Karunganni, Punjab-American 4F, and Tinnevelly cottons; report of the Special Appeal Committee for African cottons and spinning test results for A.R. Kampala, A.R. Busoga, and A.R. Jinja cottons.

8. TECHNOLOGICAL REPORTS ON INDIAN COTTONS, 1941-42. By N. Ahmad, (*Tech. Circs.*, Nos. 514, 522, 527. Ind. Cent. Cott. Comm.) The particulars given include agricultural details, grader's report, fibre particulars, spinning test results, remarks and conclusions.

Jayawant (*Kumpta*).—Yarns slightly neppy up to 1936-37, but have since shown improvement in this respect. Suitable for 41's warp.

Gaorani 6.—Yarns practically free of neps. Suitable for 35's warp.

289*F*/*K*25.—Yarns slightly neppy. Suitable for 41's warp.

9. TECHNOLOGICAL RESEARCH ON COTTON IN INDIA. By N. Ahmad. (Ind. Cent. Cott. Comm., 1942. Price Rs. 2-8-0.) A very interesting account of the work done at the Indian Central Cotton Committee's Technological Laboratory from its inception in 1924 up to 1941. The various sections of the report deal with: The history and objects of the Laboratory; fibre tests and research on cotton fibre and yarn; spinning tests and technological research; moisture content of Indian cottons, and allied problems; exhibits and exhibitions. A useful summary is included of the work carried out during the period under review,

and the success achieved. A list is given of the 89 technical bulletins and leaflets and 494 technical circulars published by the Laboratory during the course of its existence, and illustrations of the various departments are also included.

10. Indian Cotton Textiles: Organization for War Supplies. (*Ind. Text. J.*, **53**, 1942, p. 4. From *Summ. Curr. Lit.*, xxiii., **2**, 1943, p. 51.) It is pointed out that the Indian cotton industry, comprising about 10,000,000 spindles and 200,000 power looms, in addition to a very large number of handlooms, is playing a leading part in providing not only for India's own armies, but also those of the Empire and the Allies operating in the eastern theatre of war. Conditions of supply and demand during the early days of the war are reviewed, and reasons for the failure of the tender system are explained. The present system of securing war supplies for the Government by the co-operative effort of the accredited representatives of the industry forming the Cotton Textile Advisory Panel and the executive organization of the Government represented by the Cotton Textile Directorate, and the Defence authorities represented by the Controller-General of Inspection and his organizations, is described.

11. Indian Cotton Cloth. (*Man. Guar.*, 6/1/43.) Information from a reliable source in India is to the effect that cotton cloth is being given all the warmth of wool as a result of a series of experiments conducted by a well-known Indian scientist on behalf of the Indian Army. In order to impart to the new cloth the thermal qualities of wool it is treated with the seeds of two trees. The finished product is said to be warm, durable, and soft.

12. Cotton Mills and Handlooms: A Plea for Co-operation. By Rao Bahadur K. S. Rao. (*Ind. Text. J.*, vol. liii., January, 1943, p. 101.) The handloom and the power loom should, in a vast country like India, be complementary to each other, but for various reasons there have been very serious maladjustments in the relations between them. Many have endeavoured to solve the problem. Some have suggested that, in order to eliminate the competition, handlooms should specialize in weaving only artistic fabrics, which mills are incapable of reproducing due to intricacy of design and smallness of demand. But the purchasing capacity of an average Indian consumer is too low to permit him to indulge in luxury articles. Others have advocated the weaving of only handspun yarn by the handloom weavers. This, too, is not a practical proposition because the cost of producing *khaddar* is heavy and the quality is so inferior, as compared with cloth of mill-spun yarn, that the demand for it is limited. In this paper the author comes to the conclusion that co-operation between the two industries is the only way out of the present position, and he has tried to show how this co-operation may be brought about.

13. The Alkali Soil Problem and Reclamation Methods in India and Ceylon. By A. W. R. Joachim. (*Trop. Agriculturist*, xcvii., **4**, October, 1941, p. 202.) The author indicates briefly the general position in regard to alkali soils in India, and discusses at greater length the following methods adopted for the reclamation of these soils in that country. *Mechanical:* Under which are included (i) drainage, (ii) leaching with water. *Agronomic:* These include (i) the growing of suitable crops in suitable rotations, (ii) the cultivation of salt-resistant varieties of such crops, (iii) green manuring, (iv) the application of farmyard manure, compost and other bulky organic residues. *Chemical:* Of the chemicals used for correcting soil alkalinity, one type—viz., sulphate of ammonia, molasses and sugar-cane press mud—is utilized, at any rate occasionally, as fertilizer for crops. The other type—viz., gypsum, sulphur, alum and iron sulphate—is rarely, if ever, used for this purpose.

The alkali problem in irrigated areas in Ceylon and its control, with particular

reference to Minneriya, is also discussed, and the need for research on the problem and of detailed soil surveys is stressed.

14. KARNATAK COTTON AND ITS IMPROVEMENT. By S. H. Prayag. (*Ind. Frmg.*, iii., **9**, 1942, p. 488.) The Bombay Karnatak is divided commercially into two cotton belts—viz., Kumpta-Dharwar and Dharwar-American—the average area under each being 968,797 and 253,711 acres respectively. By a process of unit selection in local Kumpta (*G. herbaceum* L., var. *frutescens* Delile) a type suitable to the belt was isolated in 1918 and named "Dharwar 1." This strain was found to be superior in ginning percentage, staple length and spinning quality to the local cotton, but the ginning percentage was still inadequate. Further experiments were carried out and two types, 15-9-9 and 1A-14-3 were evolved by hybridization of Dharwar 1 with Rosea (*G. arboreum* L., var. *neglectum*). The strain 15-9-9, popularly known as "New Cross," spread on account of its superior ginning percentage, but its cultivation is being suppressed because of its high susceptibility to wilt. Search for a wilt-resistant cotton led to the evolution of the Dharwar 2 strain in 1921, but it was found unsuitable for cultivation. By crossing the two pure strains Dharwar 1 and Dharwar 2, a strain popularly called Jayawant (Triumphant) was evolved in 1928. This cotton is superior to Dharwar 1 in ginning percentage, staple length, and wilt-resistance, and 700,000 acres are under cultivation. Jayawant was further hybridized with 15-9-9, and the two new strains evolved, New Jayawant and Early Jayawant, spin almost equal to Jayawant and possess ginning percentages of 31 and 33 respectively, compared with 28 for Jayawant. As a result of continued selection cotton strains have been isolated which, though showing leaf-mottling in the initial stage of growth, are highly resistant to wilt. One of these cottons, K.F.T.-12-2-5, in addition to wilt-resistance, has high yield and quality, and is capable of spinning 44's compared with 40's of Jayawant, but unfortunately its ginning percentage is very low, only 24. American cotton has been grown in the Gadag tract of the Bombay Province since 1842. The New Orleans cotton acclimatized in Dharwar district is called Dharwar-American. In 1910 pure line culture experiments were started and after careful study a type known as Gadag 1 was isolated in 1914. This strain gives on an average 26 per cent. more lint per acre than Dharwar-American, and its staple is longer by $\frac{1}{8}$ inch. During certain seasons, however, Gadag 1 is late in maturing and suffers from red-leaf blight. To eliminate these defects it has been crossed with Co.2, and two segregates—9-7-6-6 and 4-4-1-1—have been evolved. Segregate 9-7-6-6 is characterized by high yield, higher ginning percentage and better quality of staple than Gadag 1, and has so far proved remarkably resistant to red-leaf blight. The segregate 4-4-1-1 is earlier than Gadag 1 by at least three weeks, and gives a much higher yield. Its resistance to red-leaf blight is also outstanding. These two strains are now undergoing rigid yield tests.

15. BOMBAY COTTON MILLS. (*Ind. Text. J.*, **52**, 1942, p. 319. From *Summ. Curr. Lit.*, xxii., **23**, 1942, p. 579.) Wages in the Bombay cotton mill industry during the last twenty years are reviewed and statistics given. In the period 1921-1937 wages were highest in July, 1926. From 1922 to 1933 the industry was paying a dearness allowance of 70 per cent. and 80 per cent. to time and piece workers respectively. From February, 1938, wages were raised by 12 per cent. From December, 1939, a dearness allowance equivalent to 10 per cent. of the average wages in the industry was paid to all workers. This allowance was revised and placed on a sliding scale in July, 1941, and now varies with the official cost-of-living index number. A study of the average monthly earnings of certain numerically important groups in July, 1926, and during the first six months of 1942, shows that the average earnings of winders, reelers, doffer boys,

etc., have increased by more than 30 per cent. since July, 1926. In addition to the higher wages the Bombay industry paid a war bonus amounting to 12½ per cent. of annual earnings of workers during 1941 or a bonus equivalent to 1½ months' wages in February, 1942. The industry established cheap grain shops in almost all the mills in Bombay for the benefit of employees as early as in December, 1939, and a number of mills also started canteens for their workers.

16. Mysore: Cotton Control Act. (*Ind. Frmg.*, iii., **8**, 1942, p. 451.) The extension of cotton cultivation in the Malavalli area and the establishment of a ginning factory at Maddur have been noted previously. While the scheme is progressing, a Cotton Control Act has been passed with the object of maintaining the quality and reputation of the cotton grown in various parts of the State. The Act provides for prohibition or regulation of cultivation of specified varieties of cotton in notified areas for such period as may be deemed fit. Possession, use, and mixing of different kinds of cotton are controlled and trade in inferior cotton is restricted. Import of specific varieties of cotton in quantities of more than 10 lb. and erection of ginning and pressing factories are subject to licence. The varieties of cotton and the zone from which cotton may be ginned in the factory may also be fixed by the licence.

[*Cf.* Abstr. **305**, Vol. XIX. of this Review.]

17. Studies in the Periodic Partial Failures of the Punjab-American Cottons in the Punjab. V. Physical and Chemical Properties of the Soils Associated with *Tirak* (Bad Opening of Bolls). By R. H. Dastur and K. M. Samant. (*Ind. J. Agr. Sci.*, xii., **3**, 1942, p. 474.) The soils where *tirak* (bad opening of the bolls) occurs have been found to contain abnormal amounts of sodium salts (0·2 per cent. or more) in the subsoil from the third or fourth foot downwards. The soils contain more sodium in the soluble or exchangeable form than calcium. Such soils may be located in an entire field or portions of it, and may be surrounded by normal (non-saline) soils; *tirak* occurs every time cotton is grown on them. On soils of medium (0·1-0·15 per cent.) total salt content *tirak* does not appear under favourable weather conditions and adequate water supply, but develops in dry and warm weather or in the absence of adequate water supply. The physical texture of the soil, the sodium/calcium ratio and the relative amounts of different sodium salts present affect the intensity of *tirak*. Another soil type on which *tirak* occurs is the light sandy land which produces a deficiency of nitrogen in the plant at the flowering stage. These soils are otherwise normal and *tirak* can be ameliorated by the application of sulphate of ammonia. The light sandy soils may contain normal (non-saline) subsoils or may also contain subsoils with sodium salts or with low sodium/calcium ratio in exchangeable form. If the soil is light sandy with salinity in the subsoil, *tirak* occurs in the most intense form. All these soil types may be found in the same square (25 acres). The relationship of these soil conditions with *tirak* was established from a study of (1) a growth of the crop in small plots, (2) results of detailed analysis of the soil underneath normal and *tirak* crops, (3) results of mineral analysis of the leaves, (4) the response to the application of sulphate of ammonia, and (5) the tannin test. Sandy loams with a saline subsoil did not respond to applications of sulphate of ammonia, while a light sandy soil without salinity gave a high response to this fertilizer.

VI. The Effect of Sodium Salts on Growth of Plants and Development of *Tirak*. By R. H. Dastur and S. Singh. (*Ind. J. Agr. Sci.*, xii., **4**, 1942, p. 603.) The investigation was divided into two sections. Section I. included the study of the growth of the American cotton plants under known conditions of soil. These were: (1) normal soils where *tirak* did not occur, (2) sandy loams with a saline subsoil where *tirak* was known to occur, and (3) light sandy

soil with a saline subsoil where *tirak* was also known to occur. Section II. dealt with the effects on the growth of the American cotton plants of artificial applications of sodium salts to a field with non-saline normal land. An attempt was made to obtain experimental evidence to support the view that the presence of sodium salts in abnormal amounts in the subsoil was causing *tirak* in the Punjab-American cottons. The growth of cottons was depressed in the presence of salinity in the subsoil as compared with the growth made by plants on normal soils. The depression in growth was greater in sandy loams than in light sandy soils, the subsoil being saline in both cases. The numbers of bolls per plant were greatly reduced in the former but not in the latter type of land. The bad opening of the bolls as measured by the weight of seed cotton per boll occurred in all soils with saline subsoils, and the yields were lowered. These effects of salinity on the growth and yields were found to be significantly depressing when compared with the growth and yields of plants on normal soils. Similar depressing effects on growth and yields were produced by applications of sodium salts to a known normal soil. There were, however, some differences in the effects produced on the cotton plant by each kind of sodium salt. Sodium chloride in high concentrations (16,000 lb. per acre) depressed the vegetative growth as well as the yields; thus bad opening (*tirak*) of the bolls was produced in the presence of this salt. Sodium carbonate, though depressing the vegetative growth, was found to have a stimulating effect on boll size and yields when used in low concentrations (4,281 lb. per acre). This salt in double concentration further depressed the vegetative growth and showed less stimulating effect on the fruiting parts than was found with low concentrations. Sodium chloride and sodium carbonate had no effect on node numbers but decreased the internodal lengths, indicating that they caused a disturbance in the water supply of the plants. Sodium bicarbonate, under either low or high concentrations, showed no effect on growth or yield. In the presence of sodium carbonate the depressing effect of chloride was found to increase, while in the presence of bicarbonate the depressing effect of chloride on growth and yields was found to decrease. Sodium chloride was present in abnormal amounts in the soils where *tirak* was found to occur, while sodium carbonate was not always present in such soils. As bicarbonates and sulphates at the concentrations in which they were present in the soil were not found to show deleterious effects on plant growth, sodium chloride appeared to be mainly responsible for development of *tirak* in American cottons. The presence of other sodium salts may either aggravate or lessen *tirak*, depending on the relative proportions of these salts and their actual concentrations in the subsoil.

[*Cf.* Abstr. **724**, Vol. XVI., **238**, Vol. XIX., and above abstract.].

18. United Provinces: New Strains of Cotton. By C. Maya Das. (*Ind. Frmg.*, iii., **8**, 1942, p. 498.) Out of the survey material collected during 1933-35 the strains D, A, 34/4 and 35/6 are promising. Strain D, while comparing favourably in quality with C520, has given a higher yield for the third year in succession. Some of the selections from C520—viz., C520/2 and C520/3—have also been found superior in quality to C520 bulk. The trials of the American varieties LSS, 100F, 83F, Perso-American, N15 and 289F, against C520 at the Kalai, Aligarh and Kiserwa farms have shown that all the American varieties give higher yields than C520.

COTTON IN THE EMPIRE (EXCLUDING INDIA).

19. ASIA. Cotton Cultivation in Ceylon. By J. C. Haigh. (*Trop. Agriculturist*, xcvii., **4**, October, 1941, p. 190.) The author gives an interesting account of the history of cotton cultivation in Ceylon. Climatic conditions in the island are not generally favourable for cotton, but parts of the dry zone are suitable for its cultivation. Cotton should be grown as a rotation crop in village settle-

ments. With the present method of "chena" (shifting) cultivation the average yield is not more than 2 cwt. of seed cotton per acre, whereas on the experiment stations, under a system of rotation, the yields are considerably higher. The most suitable variety for cultivation would appear to be a medium-stapled American Upland cotton. Since 1925 Cambodia has been the variety issued to cultivators, but in recent years mills have complained of its deterioration in quality. Selection work with a number of varieties is in progress. It is estimated that with the methods of cultivation now practised in Ceylon the output of cotton is unlikely to exceed 8,000 cwt. annually. Under the present contract the mills in the island will take up to 10,000 cwt. per annum, which represents only a fraction of their total requirements. Further developments in cotton cultivation may be made possible by the irrigation schemes which are now beginning to function in the dry zone.

20. Cyprus: Cotton Variety Trials, 1941. (*Ann. Rpt. Dir. Agr.*, 1941, received 1943.) Weather conditions were the worst for many years. Rainfall during the late winter of 1940-41 had been very low and the spring and summer which followed were dry and hot. Added to this the winter rains of 1941-42 did not begin until December in most agricultural areas, instead of, as normally, in October, and as a result the production of cotton was poor. Thirteen comparative cotton trials between the varieties Coker 100 and Triumph (the variety mainly grown) were carried out in different districts, and confirmed the two previous years' findings that Coker 100 is superior to Triumph under all conditions in quality, yield and ginning outturn.

21. AFRICA. East Africa: Cotton Season, 1942-43. (*Uganda Herald*, 23/12/42.) The Governments of Kenya, Uganda and Tanganyika have decided to purchase the whole of the cotton crop in their respective territories at a fixed price level for the season, and to make arrangements for disposal with minimum possible interference with normal trading channels in East Africa. In Kenya and Uganda, where the matter presses, it is proposed to dispose of the crop through an approved Exporters' Group operating in Kampala. It is anticipated that similar arrangements will later be made in respect of the Tanganyika crop. A Formation Committee is being set up immediately to advise Government on the constitution and method of operation of the Exporters' Group.

22. Gold Coast: Cotton Production. (*Crown Colonist*, February, 1943, p. 135.) Cotton is grown in quantity only in Togoland, where most farmers grow it interplanted among food crops. The crop for 1941-42 was estimated at 25,000 lb. seed cotton, and the lint will mainly be used locally for weaving cloth and making thread. Demonstrations of an improved type of spinning wheel were made in the district by the staff of Achimota College. More recently an advertisement has appeared in the Home papers for a spinner for the College who should be conversant with the process of dealing with raw cotton up to the finished yarn.

23. Nigeria: Cotton Industry, 1941-43. (*Half-yearly Rpt. to September* 30, 1942.) *Northern Provinces.*—The 1941-42 cotton crop showed a considerable reduction over the previous season, due, as stated in the previous report, to unfavourable weather and to changing war conditions.

The quantity of seed issued for the 1942-43 season was 5,391 tons, which was 693 tons less than in 1941. A slight decrease was general in all cotton-growing provinces and was attributed to the preference given to grain and groundnut cultivation. Propaganda was carried out to ensure economy in the use of seed. In Katsina Province an increased acreage was sown, but as most of the cotton was planted late and rainfall was below average, the crop is not

expected to exceed 15,000 bales. Transport difficulties in the Niger Province made it impossible to distribute seed according to plan; the crop was planted late, but weather conditions were favourable. In Zaria Province 20 per cent. less seed was distributed, and the number of markets it is proposed to open has been limited to seven in an effort to reduce the motor haulage needed to transport seed cotton to the ginneries. Crop prospects are favourable in the Bauchi, Sokoto and Bornu provinces. With the rise in the cost of living, and increased demand for locally woven cloths, it is somewhat doubtful if the estimate for the Northern Provinces of 28,000 bales for export will be realized.

Southern Provinces.—An excellent crop of 14,705 bales was produced in 1941-42, and the quality was good. Prices were less than the previous season, being 8s. 2d. per cwt. compared with 8s. 9d. in 1941. A total of 77 tons of seed was distributed for the 1942-43 season, compared with 92 tons in 1941; the main cause of the decrease being unusually dry weather experienced in July and August.

24. NYASALAND: COTTON INDUSTRY, 1940-41. (*Ann. Rpt. Dpt. Agr.*, 1941, received 1942.) The total number of growers in the whole Protectorate was approximately the same as in the previous season; production, however, was much reduced owing to the very dry season in the Southern Province. In the Lower River area the acreage under cotton was much less than in 1940 owing to the fact that individual gardens were smaller, and because many natives, although they prepared land and took seed, were unable to plant for lack of rain. Fully half the acreage planted in this area failed completely, and everywhere the plants ceased flowering and died after the main crop had been harvested in June and July. Drought alone was the limiting factor, since insect attack was comparatively light. In the Northern Province high yields per acre were obtained in Kota Kota, Dowa, Dedza, and Ncheu districts and production was 47 per cent. greater than last year. The rains, though less than usual, were well distributed and therefore adequate for the crop. Insect pest attack was relatively slight, since the drier weather was unfavourable to its development, and the close season had been rigorously enforced. In the North Nyasa District the rains were shorter and more erratic and the crop was about the same as last year. The total production in the Northern Province showed an increase of 28 per cent. on that of 1940. The cotton was bought in two grades only this year: "Good," which averaged 1·08 pence per lb., and "Ordinary," which averaged 0·299 penny per lb. The total sum paid out to Native Trust Land growers was £24,259.

At the Domira Bay Station of the Empire Cotton Growing Corporation good average yields of cotton were obtained in spite of the short growing season consequent upon the rains starting late and ceasing early. The close season measures for the control of pests continued to be successful. The high-yielding strains, varieties and crosses accumulated at the Station were planted in small plots pending the results of the examination of lint samples sent to England, on consideration of which those below a certain standard of lint quality would be eliminated. Yields ranged from 374 lb. seed cotton per acre for N.17 from Uganda up to 738 lb. for the high-yielding U4×Cambodia×U4 cross HK. 95 per cent. of the cotton was clean and white. A small bulk trial was planted but suffered severely from termite attack. Termite damage to cotton was common where cotton was grown on land previously resting under pigeon pea. It was shown that damage to cotton following pigeon pea was ten times as great as when cotton followed groundnuts, and the main rotation was provisionally modified for cotton to follow maize and groundnuts. The work of the Insect Pest Control Staff of the Corporation was continued during the season, and much useful information was obtained in connection with the two major pests of cotton, red bollworm and stainer.

25. Cotton Industry, 1941-42. (*Nyasaland Agr. Qrtrly. J.*, **2**, 4, October, 1942, p. 2.) Marketing in the Southern Province commenced in August when over 2,600 tons of seed cotton were sold. The Chikwawa crop is considerably heavier than anticipated, and is estimated at 4,000 tons. The late crop in the Chiromo area and the south has been attacked by red bollworm. In the Central Shire District the total bought during August exceeded the original estimate of 150 tons by 26¾ tons. In North Nyasa 67 tons of cotton seed have been issued.

26. Prospects for the 1942-43 Season. A report issued by the Department of Agriculture in February last stated that in the Southern Province good planting rains had been considerably later than usual, with the result that cultivators were still engaged with their food crops at the time when they would normally have given their attention to cotton. In the Lower River districts the final acreage under cotton might possibly be less than in the previous season, the yields largely depending upon whether there were any prolongation of the rainy season to compensate for the tardy beginning. In the Northern Province prospects were slightly more favourable, and increased production might be expected if growing conditions during the next two months were satisfactory.

27. A Simple Method of Making Compost. By A. P. S. Forbes. (*Nyasaland Agr. Qrtrly. J.*, **2**, 4, October, 1942, p. 21.) Propaganda has been carried out in Nyasaland for the past four years to induce the native cultivator to make compost, since the Indore process was found too complicated for general use. The simpler process advocated consisted of digging shallow pits near the cultivator's home, throwing all the house refuse into the pits, as well as quantities of easily available green weed refuse, leaves of trees, and grass. Little water was added apart from the natural rainfall, and the heap might be turned 2 or 3 times during the wet weather. The compost took between 3½ and 4 months to manufacture, and it was definitely beneficial to the native crops. The results of the first year of a trial commenced in 1941 to test the relative values on plots of maize of Indore compost, village compost, and no compost, indicated the superiority of the Indore compost over the village compost, but the latter, in turn, gave better results than the no-compost plots. A chemical analysis showed the Indore compost to contain almost double the amount of nitrogen and phosphoric acid, and three times the amount of potash compared with the village compost, and the final C/N ratio was appreciably higher. The results in the field suggest that perhaps in the first year much larger percentages of the plant food materials were available in the case of the Indore compost. Naturally, the more ash and animal refuse added to the village compost the richer would be the final product. A modification of the native system of compost-making is suggested for European estates in Nyasaland. The following are the costs per ton of the different processes: Village compost, 10d.; Village compost, with water added artificially, 1s. 5d.; Indore compost, 3s. 1d.

28. Southern Rhodesia: Cotton Industry, 1941-42. From the report of the Cotton Specialist, Major G. S. Cameron, we learn that the season opened favourably for cotton, but the early promise was not maintained. The crop lived up to its reputation, however, of being able to withstand prolonged droughts, and in the end results were much better than anticipated.

At the Cotton Station, Gatooma, the results of variety trials showed two new strains, 9L18 and 9L34, to be well ahead of any other strains at the time available. In addition to being good yielders, they showed a definite improvement in lint quality and good opening, and are now in process of being bulked up for commercial issue. In rotational trials, maize following cotton on poor land gave much improved yields, but the same results were not obtained on

land which had been composted. Work on the design and manufacture of a reliable compost spreader had to be abandoned, but the low loading wagon, constructed for the collection of farm waste, continued to give satisfactory service. In the cotton breeding experiments, only two out of six strains under trial were retained. Third-generation progenies of some of the colchicine and other "doctored" plants continued to show prolific flowering and fruiting, one such family creating a record in this respect as far as Southern Rhodesia is concerned; but unfortunately the flowers were small, and some of the lint was not up to expectation. Over a thousand plant selections were made in the field, many of these from material crossed and backcrossed prior to 1938, but over half of the selections were rejected after laboratory examination, mostly on account of lack of character in the lint. The crop suffered very little from pests, with the exception of termites, which appear to be causing more damage than in former years. There was very little angular leafspot disease and no evidence of blackarm, but during the drought period, early in the season, seedlings were reduced by attacks of "sore-shin" fungus. Owing to the larger crop ginning operations had to be continued much longer than in previous seasons. The preliminary stages of the absorbent cotton wool industry were negotiated, and the boiling process suitable to local conditions was evolved. Much appreciation is expressed of the help of the Chief Chemist and staff of the Division of Chemistry in connection with the various problems of this industry. Opening machinery, carding engines, and interleaving apparatus were installed during the year. The spinning mill buildings were nearly completed, and should be ready for occupation early in 1943.

Prospects for the 1942-43 *Season.*—In this connection Major Cameron writes: "It is difficult to forecast what increase in cotton acreage is likely to take place in the ensuing season. In the Hartley district the increase is considerable, but not excessively so. Results of planting in other districts have not yet come to hand. The further expansion of the native cotton-growing industry is now the responsibility of the Department of Native Affairs, although the main issues of cotton seed and the responsibility of purchasing the crop remain with the Cotton Research and Industry Board. Under this arrangement it is confidently expected that native cotton growing will go ahead, but to achieve more rapid progress it is felt an experienced officer of the Native Department should be detailed specially for cotton propaganda purposes."

29. Summary of Cotton Pickings at the Cotton Station, Gatooma, 1942. (*Rhod. Agr. J.*, Sept.-Oct., 1942, p. 346.) Expressed as percentage of native labour able to pick categorical amounts of seed cotton per man per day.

(*Average of first and second pickings.*)

Per cent.		*lb.*		*lb.*
2	of the labour picked between	30	and	35
2	,, ,, ,, ,,	35	,,	40
9	,, ,, ,, ,,	40	,,	45
18	,, ,, ,, ,,	45	,,	50
24	,, ,, ,, ,,	50	,,	55
38	,, ,, ,, ,,	55	,,	60
6	,, ,, ,, ,,	60	,,	65
1	,, ,, ,,	over 65		

The average yield of seed cotton per acre was 650 lb.

The crop opened earlier than usual and was over-ripe before harvesting was possible. This resulted in the cotton being easier to pick, as it came away freely from the bolls, and there was little "pulling" to be done. Such easy picking conditions should not be expected in, say, a year of late autumn rains.

30. Bulletin for Cotton Growers. By G. S. Cameron. (*Rhod. Agr. J.*, Sept.-Oct., 1942, p. 341.) A revised edition of the previous Cotton Bulletin No. 1157, the supply of which has become exhausted. The information given is concerned with cotton as a rotation crop; choice of land; preparation of the soil; machine or hand planting; thinning; cultivation and weeding; fertilizing, use of compost; harvesting; ratooning. Under the heading of Ginning and Marketing notes are included on the packing of cotton; marking of woolpacks; despatches to ginnery; ginning fee; payment for crop; guaranteed prices; ginning outturn; and seed supply. In conclusion, the author makes the following recommendations: Prepare land in plenty of time and secure a good even tilth; order seed well in advance; plant shallow and as early as possible, say in November; use plenty of seed; thin out plants when 4-6 inches high to single plants spaced at intervals of 6 inches.

31. Swaziland: Cotton Production Progress. (*Crown Colonist*, February, 1943, p. 149.) Discusses the efforts made by the officers of the Empire Cotton Growing Corporation to encourage cotton growing among natives in Swaziland, with a view to introducing a new outlook on agriculture by means of cotton as a cash crop. Progress in agriculture is badly hampered by the natives' lack of money and equipment, though they may be the owners of substantial herds of cattle. Their only implements are a plough and a hoe, both of which are often practically worn out. Money to purchase adequate equipment can best come from the sale of a cash crop, and over large areas in Swaziland cotton can fulfil a most useful rôle in this respect, and promote a gradual rise in the standard of living of the natives.

32. Sudan: Cotton Industry, 1941-43. A report received from the Department of Agriculture states that the 1941-42 cotton crop was substantially less than that of the previous season in spite of the increase in yield of the American variety over that of 1940-41. The decrease in the Sakel cotton crop was due to small crops at Tokar and on the White Nile Private Estates.

Prospects for 1942-43.—In the Gezira the crop is a better one than last season, but harvesting may be hampered by shortage of labour. Prospects are good in Tokar and the Gash Delta. In the former area X1730A has been sown instead of Sakel, but both cottons have been planted in the Gash Delta and on the White Nile Estates. No cotton has been sown in the Berber and Dongola areas, food and forage crops being deemed of greater importance. In Kordofan, also, the cotton acreage has been reduced owing to the necessity for the greater production of food crops.

33. Cotton Plant: Rotation Experiments in the Sudan Gezira. By F. Crowther and W. G. Cochran. (*J. Agr. Res.*, **32**, 1942, p. 390. From *Summ. Curr. Lit.*, xxii., **24**, 1942, p. 580.) A detailed account is given of rotation experiments with cotton in the Sudan Gezira. The results show that frequent fallows are the first necessity in any rotation for cotton in the Sudan Gezira. Cotton should not be sown more often than once in three years, and even that may be too frequent for maximum yields. Between cotton crops at least a year's fallow is essential, and the longer the fallow the greater the benefit. The experimental results support fully the soundness of present rotation throughout the Gezira scheme. Up till 1932-3 the rotation was three-yearly, with at least one full year's fallow per cycle. Then the rotation was changed to four-yearly, with two or three years' fallow per cycle. Inclusion of dura (giant millet) in the rotation invariably reduces cotton yields. Least harm is done when dura immediately follows cotton, with at least one fallow year before cotton recurs. Lubia (hyacinth bean) was in no case markedly superior to fallow, but may prove slightly more beneficial than fallow when included in a short rotation

following cotton or dura. On the other hand, if grown after fallow, lubia decreases the cotton yields. In view of the large increases regularly obtained from nitrogenous fertilizers, the benefit of lubia is surprisingly small and that of fallow surprisingly great.

34. INFLUENCE OF WEEDS ON COTTON IN THE SUDAN GEZIRA. By F. Crowther. (*Emp. J. Exp. Agr.*, xi., **41**, January, 1943, p. 1.) The paper describes two related experiments investigating the effect of hoeing weeds on the growth and yield of cotton in the Sudan Gezira. In one experiment the weeds grew among the cotton crop, and in the other on bor (resting) land which did not come under cotton until a complete year afterwards. The results of the first experiment demonstrated the wisdom of the current practice of clean-weeding from cotton-sowing onwards. Where weeds were allowed to grow unrestrictedly up to 2 months after sowing, the cotton was severely checked in its early growth and final yields were reduced by up to 30 per cent. In the two treatments of the second experiment, (*a*) the normal practice of allowing weeds on the bor-land, destined for cotton a year later, to ripen and dry off at the end of the rains, was compared with (*b*) cutting the unripe weeds at ground-level while they were still growing rapidly. Cutting the unripe weeds conserved moisture in the soil until the following rains 8 months later, increased soil nitrates five-fold, and led ultimately to an increase in the yield of the cotton crop by 43 per cent. over that of normal practice. An additional 10 kg. per feddan nitrogen were taken up by the cotton crop when the unripe weeds had been cut a year previously. Possible agencies are suggested for the cause of this difference, but existing information precludes assessment of their relative importance. Under normal practice termites may cause wastage of nitrogen by removing ripe weeds down to a soil zone untapped by the cotton roots, or ammonia may be lost during the breaking-down of protein in the alkaline soil. Nitrogen-fixation in the soil may be prolonged where moisture is conserved. Since throughout the Irrigation Scheme the bor-weeds are normally allowed to ripen without interference, the results indicate how a general increase in cotton yields may be attained.

35. TANGANYIKA: ANNUAL REPORT OF DEPARTMENT OF AGRICULTURE, 1941. (Received 1942.) The year was on the whole a disappointing one climatically. In those parts of the Territory which usually get their main rains between November and May the crops got off to a good start, but this early promise was more than neutralized by the abrupt cessation of the rains altogether at the end of March, and the result was that in these areas, although cotton did extremely well and was of high quality, grain and other crops had only a moderate season. Cotton production during 1941 reached a record of 72,766 bales, exceeding the previous record of 67,369 bales in 1936 by more than 5,000 bales. The Lake Province produced a crop of just over 50,000 bales, which was the highest recorded for this area, and reflected great credit on the work carried out over many years by the staff of the Department and officers of the Provincial Administration associated with them. The Lake Province crop was disposed of satisfactorily, but some little difficulty was experienced at first with the rest of the Territory's cotton; this, however, was later overcome, and with the exception of some 2,000 bales, mostly of poorer qualities, the rest of the crop was disposed of at very good prices.

36. UGANDA: COTTON PROSPECTS, 1942-43. The latest information from the Department of Agriculture states that 878,578 acres were planted to cotton. In general, weather conditions during the usual planting period were dry, with the result that over half the crop was sown in August. Continued propaganda to obtain closer spacing met with encouraging response from growers in most

districts. Unfortunately dry weather again set in towards the end of September, and, with the failure of the normal "autumn" rains, most of the acreage planted will give very poor yields. Reports of grade are good in all areas, but length and strength of staple are below average owing to the adverse weather conditions. The marketing of the crop in the Eastern Province and the northern part of the Western Province began on January 25. In Buganda and the remainder of the Western Province marketing will begin on February 11. Prices have been fixed for each zone throughout the buying season.

37. Uganda Cotton Crop and India. (*Man. Guar.*, 25/1/43.) The failure of the late rains which is reported from East Africa, though it will not affect the food crops, which depend mainly on the first rains, will affect the Uganda cotton crop, which depends particularly upon them. The Uganda cotton crop was rather below the average in 1941-42, with 236,370 bales of 400 lb. With Japan out of the market, India is more important than ever as a buyer, and in fact it took nine-tenths of total exports in 1941. India's demand is persistent in view of the difficulties in getting long-staple types from the United States.

The co-ordinating Supply Council recently established for East Africa is making every effort so to control distribution that prices do not rise unduly. By a system of registered distribution through recognized wholesalers the first commodities to be controlled include certain lines of cotton goods imported from India. An Exporters' Group is being formed to deal with the disposal of all East African cotton, but for sales of cotton to unregulated markets such as India there is not likely to be any willingness to forgo all the profit available merely so that there may be extra profit for Bombay market speculators.

38. WEST INDIES. Barbados: Cotton Industry, 1942-43. (*W. Ind. Comm. Circ.*, December, 1942, p. 211.) Up to the end of August, 1942, applications to plant only 372 acres had been received, and it was certain that the total acreage would be less than that of the previous year. This was disappointing since cotton was urgently required by the Imperial Government for war purposes and cotton seed locally for cattle food and edible oil. The smaller acreage might be accounted for by the dry weather prevailing at seed distribution time, the fact that some growers were unaware that cotton would count as part of the requirements under the Local Food Production (Defence) Control Orders, and the severe caterpillar defoliation of the previous season.

39. St. Lucia: Guatemala Grass as a Fodder Crop. By G. B. Gregory. (*Trop. Agr.*, October, 1942, p. 192.) An experiment with Guatemala grass, laid down in 1939 on an alluvial soil of medium fertility, is described. Simple manurial treatments showed no significant differences, but with a cutting rotation of 8 weeks and extending over nine rotations a mean yield of 4·71 tons per acre per cutting was obtained, equivalent to 30·1 tons per acre per annum. Yields fell rapidly as the trial progressed, due, apart from seasonal rainfall variation, to the fact that in accordance with present local practice only one initial manuring was given. It is suggested that planting in furrows is preferable to flat planting in order to obtain a more firmly established stool; a furrow spacing of 3 feet with stools at 1 to 1½ feet in the row might be more feasible than using a 2 by 1½ feet spacing. From its behaviour under the conditions of the experiment, and from field observations in other planted areas, Guatemala grass is recommended as a dual fodder and erosion-control crop for contour strip planting on sloping land; it can thus contribute to the solution of two of St. Lucia's most urgent agricultural problems.

40. St. Vincent: Cotton Industry, 1940-41. (*Ann. Rpt. Dpt. Agr. St. Vincent*, 1941. Received December, 1942.) *Sea Island Cotton Industry*, 1940-41.—From the estimated total area of 5,180 acres 1,527 bales of 400 lb. were obtained.

The late crop was adversely affected by the early and severe dry season, and the yield averaged only 117·9 lb. of lint per acre. Damage by diseases and pests was relatively small. The whole of the white lint was sold to the Ministry of Supply at 25d. per lb. f.o.b. Stained lint was shipped on consignment to the United Kingdom and sold at 9d. per lb. c.i.f., which was 1d. less than the general price obtained in 1940.

1941-42 *Crop.*—An estimated area of 4,747 acres was sown, which represented a decrease on the 1940-41 acreage. A total of 49,356 lb. of planting seed was sold by the Government Cotton Ginnery compared with 45,656 lb. in 1940. Germination was patchy, possibly from the severe dry season in 1941, causing damage to the seed. Growth conditions were on the whole fair, and the crop made good progress to the end of the year. Attack by *Alabama argillacea* was serious in the North Windward and the Leeward Districts, and where spraying with lead arsenate was delayed the plants were completely defoliated, some 400 acres being damaged in this way.

Marie Galante Cotton Industry, 1941-42.—The crop is grown exclusively in the South Grenadines and was rather better than usual, production being 198 bales of 300 lb. each. The whole of the lint was exported on consignment to the United Kingdom.

41. COTTON EXPERIMENT STATION, 1940-41. By H. L. Manning. (*Ann. Rpt. Dpt. Agr. St. Vincent,* 1941. Received 1942.) Maintenance and improvement of standard V.135 was carried out during the season, and comparison against the new VH hybrid material indicated the satisfactory progress of the latter. The greater variance of this VH material offers more scope for improvement than the comparatively stable V.135 material. In addition to other routine plant-breeding investigations a manurial experiment, with two levels each of nitrogen and potash and early and late application, was planted. Results indicated no significant advantage to be gained from an early application of the fertilizers. As may be expected under St. Vincent conditions, the nitrogenous fertilizers had the greatest effect on yield, though the importance of potassic fertilizers in seed formation also was apparent.

42. STUDIES OF OIL FORMATION IN THE V.135 AND M.S.I. VARIETIES OF SEA ISLAND COTTON IN ST. VINCENT, B.W.I. By C. C. Seale. (*Trop. Agr.*, November, 1942, p. 210.) Data are presented showing the importance of the production of cottonseed oil in St. Vincent. Experiments were carried out during the 1938-40 crop seasons to determine the effect of manuring on oil formation and the rate of development of oil in the V.135 and M.S.I. varieties of Sea Island cotton. Results with manuring showed that nitrogen affected both the oil content and the total yield of oil of mature V.135 seed, the former being decreased and the latter increased significantly. The nitrogen effect on oil content was confirmed with developing V.135 seed, and was also in line with the results of American investigators on Upland cotton. Potash and phosphate produced very little effect on mature or developing V.135 seed. In tracing the rate of development of oil in the two varieties the following results were obtained. Moisture content decreased with an increase in the age of the seed, the decrease following boll split being the normal drying out of the mature seed. There was a period of intense oil formation in both varieties extending from about the 25th to the 40th day; this grand period of oil formation occurred some 10 days earlier in an Upland variety. Splitting of the bolls commenced in both varieties between the 40th and the 45th day; the entire period occupied about 15 days for M.S.I. as compared with about 20 days for V.135. At the commencement of the splitting of the bolls oil formation had already ceased. The rate of oil formation in the two varieties was practically the same, although

there was a seasonal variation in the oil content of both cottons. The oil content of mature Sea Island seed was on the whole higher than that of American Upland seed. After the 30th day of age the refractive index of the oil in the seed showed a slight increase with an increase in the age of the seed. There was little difference between the refractive index of the oil of mature Sea Island and Upland seed.

43. AUSTRALASIA. QUEENSLAND: COTTON INDUSTRY, 1941-42. (*Rpt. Dpt. Agr. and Stock, Qnsld.*, 1941-42.) Adverse climatic conditions during the later months of the previous cotton season continued almost unbroken during the first half of 1941-42, and the area planted to cotton was reduced to roughly 50,000 acres, although sufficient seed was supplied to plant 73,000 acres. Some outstanding yields were obtained from irrigated areas in the main cotton-growing districts. Yields resulting from the practice of growing cotton under dry farming conditions again indicated that the difficulties associated with this system were being successfully overcome.

In connection with breeding and selection work, progress was made in the attempt to obtain superior strains of Oklahoma Triumph, one of the most promising quick-maturing cottons grown in Queensland. A very satisfactory strain of Lone Star was evolved which appeared worthy of test as a rain-grown crop. Stoneville was another variety which showed improvement. Improvement work was also continued with New Mexico Acala, which may become a leading cotton for the production of an inch or longer staple in the drier districts. Much interest again centred in the breeding work on the Miller variety, partly because it is the most extensively grown cotton in the State, and partly because of the important rôle it is playing in the work of evolving a jassid-resistant cotton. Satisfactory progress has been achieved in this direction, since 49 out of 100 Miller strains planted in a jassid-infested area gave promise of being jassid-resistant and of producing a suitable type of fibre.

44. FIJI: COTTON INDUSTRY, 1941-42. A report received from the Director of Agriculture states that no commercial crop of cotton was grown in Fiji during the season under review. The work of the Experimental Station was restricted to the maintenance of the existing strains, Sea Island and Sea Island Backcrosses 172, 172/23/1 and 172/23/5. In connection with breeding and selection work, 25 progeny rows of Kidney-Sea Island Backcross, Third Backcross, Montserrat Sea Island and Sea Island were grown. All the strains were heavily infested with jassids, causing shedding. Individual records of progenies could not be kept, but yield figures of the different strains were extracted as follows:

Backcross	84 lb. seed cotton per acre.
Sea Island	96 ,, ,, ,, ,, ,,
Third Backcross	183 ,, ,, ,, ,, ,,
Montserrat S.I.	63 ,, ,, ,, ,, ,,

Thirty-eight single plant selections were made from the above strains; shedding of bolls was severe, and only a very small quantity of selfed seed was obtained. Lint from Kidney-Sea Island Third Backcross was considered far too harsh to justify further work on this strain, and most of the plants have now been dropped. It is thought that the harshness of the lint may be due to the use of the White Flower Sea Island in making the last cross. Two Backcross reselected plants were crossed again with Yellow Flower Sea Island this season.

In regard to cotton pests, tipworm was severe on all cottons, and in late-planted crops persisted till the end of the season. Jassid appeared early, taking a heavy toll of all cottons except Sea Island Bulk, which was grown on an isolated part of the Station. Cotton aphids were observed on all cottons and caused some injury, while harlequin bug and pink bollworm were present in small numbers. The cotton stainer has been absent from cotton for some years.

COTTON IN THE UNITED STATES.

45. American Cotton Acreage for 1943. (*Cotton*, M/c, 16/1/43.) United States farmers have been asked voluntarily to reduce cotton acreage in 1943 to 22,500,000 acres—this representing a reduction of about 1½ million acres below 1942, and it would be the smallest acreage since 1895. Because of the excess supply of short-staple and low-grade cotton, farmers normally producing short-staple varieties are urged whenever practicable to grow longer-staple cottons or to shift to other crops for which the war need is greater, such as peanuts, soybeans, and feed grains.

46. Cotton Industry in the United States. (*Cotton*, M/c, 29/8/42.) Dr. A. B. Cox, Director of the Texas University Bureau of Business Research, estimates that some 5,000,000 persons in the United States are employed in agriculture or industry or commerce dealing with cotton. Approximately 3,500,000 are employed in cotton production or in various kinds of cotton or cotton-seed manufacture, with perhaps another 1,500,000 engaged in distribution of these products or in service and manufacturing industries dependent upon the cotton industry.

47. American Cotton Handbook. By G. R. Merrill, A. R. Macormac and H. R. Mauersberger. (American Cotton Handbook Co., New York, 1941. Price in U.S. and Canada $4.80, in other countries $6.00. From *Bull. Imp. Inst.*, xl., **3**, 1942, p. 206.) The object of this treatise is to give an account of the entire American cotton industry from the preparation of the soil to the marketing of the manufactured article. The three authors mentioned are responsible for the bulk of the work, but seven other experts have contributed chapters on their own special subjects; the book is therefore authoritative as well as complete. Its contents are divided into 23 chapters, dealing with such subjects as the historical background of the American cotton industry, the economic and statistical background; the cotton plant, its cultivation and varieties; ginning, classing and marketing; opening and picking operations; carding and combing; drawing and roving; spinning of cotton yarns; winding and twisting; manufacture of sewing thread and handwork cottons; spooling, warping, and slashing; weaving and designing; manufacture of knitgoods; bleaching, mercerizing and dyeing; printing and dry finishing; manufacture of terry fabrics; physical and chemical testing; laundering of cotton materials. There is a list of books on cotton (unfortunately confined to those written in English), a glossary of cotton terms, and appendixes on the use of the statistical method in textile testing (Prof. E. R. Schwarz) and on the nomenclature of dyes. The book is well illustrated and forms an excellent up-to-date reference book for all interested in the cotton trade, whether as producers, consumers or students.

48. World Supply of American Cotton, 1942-43. (*Cotton*, M/c, 27/2/43.) The world's supply of American cotton for the present season is estimated at 23,765,000 bales, compared with 23,425,000 bales in 1941-42. If world consumption should attain 12,760,000 bales the world's carry-over of American cotton on July 31 next would be approximately 11,000,000 bales compared with 11,115,000 bales in the previous season. Farmers' complaints about the labour shortage in the South have apparently had the desired effect, as according to reports from Washington the difficulty of securing labour on farms is to be remedied by the mobilization of 3,000,000 civilian workers to meet the shortage.

49. American-Egyptian Cotton in 1942. (*Cotton*, M/c, 17/10/42.) Arizona is the principal producer of American-Egyptian cotton, but in recent years production has extended into Texas, New Mexico, and California. In 1940-41 the acreage and production of American-Egyptian cotton approximately doubled

and reached a level second only to the record established in 1920. Producers of the cotton were asked this spring (1942) to expand production to the limit of the seed supply, and by July 1 the acreage was 207,500 acres, a 51 per cent. increase over 1941 and a 202 per cent. increase over 1940.

50. United States: Consumption of American-Egyptian (S×P) Cotton. (*Cotton*, M/c, 27/3/43, p. 5.) The consumption is expected to total about 26,600 bales during the first half of the 1942-43 season, or about 36 per cent. more than in the same period last season. At the current rate, consumption for the 1942-43 season would exceed 55,000 bales, against 48,000 for 1941-42. The indicated supply of American-Egyptian cotton for the present season is about 110,000 bales. The grade of the 57,400 bales ginned up to mid-January, 1943, was considerably higher than that for last season, but the staple length was shorter.

51. Cotton Research in the United States. American National Cotton Council and the Cotton Textile Institute. (*Cotton*, U.S., **106**, 1942, B51. From *Summ. Curr. Lit.*, xxii., **24**, 1942, p. 607.) A programme of scientific and economic research for the American cotton industry. The former includes: (1) chemical and physical research; (2) contacts with other scientific agencies; (3) investigations; and (4) commercial development. Basic studies are being made of cotton lint, linters, oil, meal and hulls; the industry is kept informed of cotton projects in progress at government, industrial and educational laboratories; surveys are made of opportunities for increased consumption of cotton, and work is in progress on the development of new and improved products and techniques. Recent achievements include the development of improved tyre cords, a superior type of webbing, a substitute for hemp, a crease-resistant finish, special yarns and weaves, and fastness tests. The economic research section includes (1) a complete information service for collecting and maintaining all current cotton statistics, as well as a comprehensive cotton library, and (2) factual studies on subjects directly or indirectly affecting the cotton industry.

52. New Type of American Cotton B6. (*Cotton*, M/c, 10/10/42.) Dr. A. M. Harding, President of the University of Arkansas, recently announced the development of a new type of cotton especially suited to mechanical picking. The College of Agriculture has tested the new variety, and, due to the serious farm labour shortage brought on by the war, some of the seed will be released for planting next year. The new cotton, called " B6," was evolved from the Rowden variety which is popular with textile mills. It has staple more than an inch long, is characterized by bolls forming closely around the main stem, and is said to produce more than a bale to the acre. Tests show that the mechanical picker can get about 90 per cent. of the " B6 " cotton out of a field at one picking. As a result, it was estimated that costs would be lowered about one-third. This, it is stated, would make up for the lowering in grade caused by mechanical picking. Leaders of the Arkansas Farm Bureau and the Arkansas Farmers' Union stated that the new " B6 " cotton might revolutionize the South's economy. If mechanical picking became practicable, one farm family could handle seven to eight times the acreage of cotton per season as was possible before. This would reduce the number of persons needed to get in the crop. The cost of production could, it is said, be reduced by approximately 50 per cent., and the cotton harvesting season shortened by several weeks.

53. Rapport sur une Mission d'Études Effectuée aux États-Unis du 5 Aout au 18 Octobre, 1939. By A. Brixhe. (*Bull. Agr. du Congo Belge*, xxxiii., Mars-Juin, 1942, p. 9.) This is the continuation of a report (of which an earlier instalment—not received—appeared in the Bulletin for March-December, 1941) of a mission arranged by the Compagnie Cotonnière Congolaise for the study of

cotton production in the United States. This section deals with the following subjects: the certification of seed, the application of genetics, official and private selection services, the handling of seed for planting purposes, the objects of selection, and harvesting.

54. Cotton Bags for Packing Crops. (*Cotton*, M/c, 3/10/42.) With burlap supplies shrinking, demand in the United States for cotton bags to pack agricultural commodities has expanded appreciably, and indications are that a ready market will be found for the approximately billion and a half yards of cotton bagging that the industry is making under orders from the War Production Board, according to the U.S. Cotton Textile Institute. The purpose of the order directing mills to convert looms to cotton bagging was to offset the shortage resulting from the inability of importers to obtain supplies of the jute cloths from Calcutta. For most agricultural bags cotton and burlap are interchangeable. Preparations are being made for the packing of other crops in cotton containers, among them sugar, rice, wheat, corn and linseed, beans, starch and seeds.

55. Windowless Cotton Mill: Lighting and Ventilating. Macon Textiles Inc. (*Text. World*, **92**, 7, 1942, p. 72. From *Summ. Curr. Lit.*, xxii., **18**, 1942, p. 417.) An illustrated account of the lighting and air-conditioning systems installed in a new mill in Georgia, U.S.A., which has the weaving room underground and the spinning department as a one-storey, windowless building above it. Lighting is by lines of tubular fluorescent lamps, going the whole distance of the ceilings at right angles to the looms or spinning frames. The weaving room has a " false " ceiling 9 feet from the floor and suspended 7 feet below the floor of the spinning room. The ceiling is constructed of expanded metal carrying a 1 inch layer of plaster and finished with " Celotex " acoustical tiles. The space above the ceiling is occupied by the air ducts, power and lighting cables and sprinkler pipes, and the return air ducts have screens to collect lint and fly. The ceiling to the spinning room is of plywood fastened to the roof beams. The air-conditioning plant has automatic controls.

56. Alabama: Relation of Exchangeable Potassium in Alabama Soils to Needs of the Cotton Crop. By N. J. Volk. (*J. Amer. Soc. Agr.*, **34**, 2, 1942, p. 188. From *Exp. Sta. Rec.*, **87**, 3, 1942, p. 345.) From the combined results of numerous fertilizer tests, the author concludes that about 95 per cent. of all soils studied responded significantly to the first increment (25 lb. per acre of K_2O) of applied potash and about 40 to 50 per cent. responded significantly to the second increment. For soils of the same type containing less than about 200 lb. of exchangeable potash per acre, there is a general relationship between the total yield of seed cotton and the total exchangeable potash contained in the soil. Soils which contained over 200 lb. of exchangeable potash per acre, however, frequently responded to an application of potash. It is thought that predictions of the need of the cotton plant for a second increment of potash, based on a knowledge of the texture, series, and exchangeable potash content of the soils, will be unreliable in about 35 per cent. of the cases. It is believed that differences in response to like quantities of potash are caused by differences in soil characteristics which may greatly influence the yield of cotton, and if possible these should be taken into consideration in making fertilizer recommendations on the basis of soil analysis.

57. The Response to Magnesium of Six Different Crops on Sixteen Alabama Soils. By A. L. Sommer *et al.* (*Soil Sci. Soc. Amer. Proc.*, **5**, 1940. From *Exp. Sta. Rec.*, **87**, 6, 1942, p. 775.) Corn (vegetative stage only) responded least and crotalaria and peanuts (yield of nuts) most to magnesium sulphate in greenhouse tests. Cotton and crimson clover gave considerable response.

58. Arizona: Egyptian-Type Cotton: Production. By R. H. Peebles. (*U.S. Dpt. Agr., Circ. No.* 646, 1942. From *Summ. Curr. Lit.*, xxii., **22**, 1942, p. 522.) The supply of pure seed for the Pima crop in Arizona was comparatively easy until 1922 when Upland cotton was introduced into the same region. The ill-effects of the contamination of the Egyptian-type by Upland cotton are described and an account is given of measures (including "roguing") taken to ensure the seed supply of the present varieties "S×P" and "Earlipima." Illustrations are given of plants, flowers, bolls, seeds and lint haloes of the Upland Acala and Egyptian-type cottons and their first-generation crosses.

59. Irrigation Requirements of Cotton on Clay Loam Soils in the Salt River Valley. By K. Harris and R. S. Hawkins. (*Ariz. Sta. Bull.*, 181, 1942. From *Exp. Sta. Rec.*, **87**, 4, 1942, p. 509.) Cotton of the Pima (American-Egyptian) and Acala varieties was grown during 1935-40 under several irrigation schedules on clay loam soils of the Laveen series on the Mesa experiment farm. Plants receiving an early irrigation after planting were stimulated into rapid and extensive growth before heavy flowering, and consistently outyielded those not irrigated after planting until they reached the wilting point. Subsequent irrigations were given at the same soil moisture levels. In general, the higher final yields followed the more rapid growth before heavy fruiting. Early irrigation encouraged early fruiting, as was shown by the greater percentage of the total crop harvested at the first picking. Similarity in root development was indicated by water absorption from depths of from 2 to 6 feet in August-October. Excessive vegetative growth during fruiting, even though the plants had been stimulated into rapid growth before fruiting, could be prevented largely by regulation of irrigation. Plants making quickest growth from planting to July 31 and continuing growth at a moderate to low rate from July 31 to September 10 gave the best yields. Cotton plants evidently should be allowed to reduce available soil moisture more completely between irrigations during fruiting than prior to this period, unless stressed too severely before fruiting. Detrimental effects of puddling of the soil during seedbed preparation might persist throughout the entire season. Cotton provided with limited soil moisture during fruiting had a higher ginning percentage than that given abundant soil moisture during this period.

60. Louisiana: Cotton Marketing Practices in Selected Local Markets. By H. W. Little and R. A. Ballinger. (*La. Sta. Bull.*, 345, 1942. From *Exp. Sta. Rec.*, **88**, 1, 1943, p. 121.) Information related to the 1940-41 cotton marketing season was collected by personal interviews from 184 cotton growers and 52 cotton buyers in 8 markets in the northern and central parts of the State. The average production of cotton per grower, the market outlets used by growers, their knowledge of quality and market conditions, and the practices of local cotton buyers are analysed and discussed. Some of the findings and conclusions were that "30 per cent. of the producers had no knowledge of the quality of their cotton when they sold it, and another 25 per cent. knew only what the buyer told them concerning the grade and staple length of their bales. . . . While nearly one-half of the producers had available current information concerning the price of futures and the spot prices of middling 15/16 inch cotton, only 7 per cent. had access to information regarding premiums and discounts for various grades and staple lengths." Nearly 50 per cent. of the total volume of purchases in the local markets studied were made by independent buyers, over 40 per cent. by salaried buyers, and about 10 per cent. by persons buying on commission. "Practically all buyers at least made an attempt to determine the grade and staple length of a bale of cotton before purchasing it. However, it seems probable that a considerable proportion were not able to do this very

accurately. About three out of every five local buyers interviewed had no means of checking their work against official grade standards or staple types. Most of the other buyers had access to the standards for only a few of the more common grades and staple lengths."

61. Mississippi: Cottonseed Treatment. By J. A. Pinckard. (*Circ.* 103. *Miss. Agr. Exp. Sta.*, 1942.) Discusses briefly cottonseed treatment in the State, materials recommended and their methods of use and costs, storage of treated seed, and precautions to be taken when treating seed with chemicals.

62. Field Crops Experiments, 1941. (*54th Ann. Rpt. Miss. Exp. Sta.*, 1941. Received 1942.) Work on cotton included varietal trials, cultivation experiments, cotton disease investigations, rotation experiments, and the uses of cottonseed.

63. Cotton Chopping. (*54th Ann. Rpt. Miss. Exp. Sta.*, 1941, p. 47.) Cotton chopped with the mechanical chopper cost an average of $0.25 per acre with an additional hand-hoeing cost of $1.70 per acre, and yielded 1,906 lb. seed cotton per acre. Hand-chopped cotton cost $1.04 per acre with an additional hoe cost of $1.75, and yielded 2,074 lb. seed cotton per acre. The ability to get cotton chopped at an earlier date with the mechanical chopper and during periods of scarce and high-priced farm labour seems worth consideration.

Cotton Picking.—From 21 varieties of cotton used for testing the mechanical cotton picker, the machine picked from 85·6 to 94·8 per cent. of the cotton, knocked from 2·1 to 6·3 per cent. to the ground, and left from 1·8 to 8·8 per cent. on the stalks. The picker reduced the amount of moisture in most varieties 1 to 2 per cent., but the cotton graded from 0·7 of a grade to 2 grades lower.

64. Fertilizers other than Nitrogen for Cotton in the Delta. By R. Kuykendall. (*Miss. Farm Res.*, **5**, 7, 1942. From *Exp. Sta. Rec.*, **87**, 6, 1942, p. 774.) The development of fertilizer use and response under Delta soil conditions in Mississippi is discussed. Based on tests from various areas, it has been found that there are conditions under which phosphorus and potash are needed for maximum crop production.

65. Weed Control and Cotton Tillage on Blackbelt (Prairie) Soils. By T. N. Jones *et al.* (*Tech. Bull.* 29. Miss. Agr. Exp. Sta., 1941. Received 1942.) The purposes of this study were: to determine the most efficient and economical method of seedbed preparation and cultivation for cotton production and weed control; to correlate the physical conditions of the soil with machine operations as influencing cotton production and weed control; to determine the effect of different methods of seedbed preparation and cultivation on the cotton root system. The following is a summary of the results. Fall and winter preparations produced highest yields. Deep preparation produced slightly higher yields than shallow preparation. Methods recommended: (*a*) plough in the fall or winter and bed in the spring with a breaker; (*b*) if prepared in the spring, bed with two operations of the breaker or its equivalent. Preparation has more effect on yields than cultivation. Cotton must be cultivated in order to control weeds. Cultivation may be done most efficiently about every 10 or 12 days, ending between July 1 and July 10, and using methods and implements that will control weeds with minimum injury to the cotton plants. With shallow seedbed preparation cultivation should be shallow, especially after plants are 6-8 inches tall, to avoid injury to the roots; with deep seedbed preparation deeper cultivation can be practised.

66. New Mexico: Field Crops Investigations, 1941. (*New Mexico Sta. Rpt.*, 1941. From *Exp. Sta. Rec.*, **87**, 3, 1942, p. 366.) Cotton work included varietal trials, breeding work, fertilizer experiments, seed treatment and irrigation tests, tests of different forms of sulphur, crop sequences with cotton, effects of different irrigation treatments on maturity, lint, and yield factors of Acala cotton.

67. Cottonseed Treatments. By G. Staten. (*New Mexico Sta. Bull.*, 290, 1942. From *Exp. Sta. Rec.*, **87**, 5, 1942, p. 683.) Tests with acid-delinted and undelinted cottonseed and the effects of various dust treatments on them are reported. Significant correlations of percentages of floating seed and of germination were found, but some types of immature seed could not be removed by cleaning. Considerable improvement in the germinability of low-quality seed by cleaning was noted, but little improvement in that of good quality seed could be expected. Normal dosages of several commonly used dust treatments, including New Improved Ceresan, 2 per cent. Ceresan, and Spergon were found to decrease the rate of germination slightly. Overdosages of the first delayed germination seriously, and toxic effects on seedlings were noted. Dust-treated seed was held under three different storage conditions for over a year without injury to germinability. New Improved Ceresan and 2 per cent. Ceresan gave excellent protection against seed rotting in cold soils for both delinted and undelinted seed, and Spergon was almost as good as either of these treatments. Sanoseed and Cuprocide afforded some protection but were comparatively ineffective. No difference was found in the ability of acid-delinted and undelinted seed to resist rotting in cold soil. Spergon, New Improved Ceresan, and 2 per cent. Ceresan, in the order named, proved effective in increasing seedling emergence, preventing pre-emergence damping-off, increasing survival stands, reducing post-emergence damping-off in some cases, and increasing survival stands of healthy plants in soils infested with *Rhizoctonia*. Cuprocide and Sanoseed were ineffective, and none of the treatments was very satisfactory in preventing infection after emergence of the seedlings. In field-plot trials acid-delinted seed produced slightly (not significantly) higher yields than undelinted seed. Both New Improved Ceresan and 2 per cent. Ceresan were effective in increasing the survival stand of plants in the field but did not significantly increase the yield of a full field stand. Use of a good dust treatment is recommended regardless of whether delinted or undelinted seed is planted. Some of the dusts are toxic to man, so care should be used to prevent inhaling or allowing them contact in quantities with the skin.

68. North Carolina: Cotton Research, 1939-40. (*N. C. Rpt. Agr. Exp. Sta.*, 1940. From *Pl. Bre. Abs.*, xiii., **1**, 1943, p. 18.) A new strain of Mexican cotton has been produced; it is earlier, more productive and makes a smaller growth than the parent variety and has a staple length of 1 inch or over. Certain hybrids and selections from other varieties are also promising. Clevewilt, Coker 4 in 1, Dixie Triumph and Wannamaker Early Wilt are good wilt-resistant varieties.

69. Oklahoma: Cotton Variety Tests in 1941. By H. E. Dunlavy *et al.* (*Oklh. Sta. Misc. Pubn.*, 4, 1942. From *Exp. Sta. Rec.*, **87**, 3, 1942, p. 369.) Continued co-operative varietal studies with cotton indicated that several strains of Nucala (Acala 5) are promising for profitable production in most sections of south-western Oklahoma, and that Deltapine, Oklahoma Triumph, Stoneville, and Rowden variety groups are well adapted to central and eastern Oklahoma. In all three sections Hi-Bred is a high-yielding cotton with a very short staple. The results of six variety and strain tests conducted in 1941 are tabulated.

70. Cotton in War Time. By K. C. Davis and W. A. Williams. (*Curr. Farm Econ.*, Ser. 49, vol. xv., 4. Okla. Agr. Exp. Sta., 1942.) A comparison of Oklahoma production and military requirements. It is stated that at present there is a so-called surplus in the United States of some ten million bales of cotton, but most of this is short staple or low grade, or both, and under existing conditions cannot be used in America. Therefore, the United States has a surplus of cotton and at the same time a shortage of *usable* types. From the standpoint of profit and also of patriotism, the Oklahoma farmer must not add to this stock of unusable cotton, but must produce the middle staple length cottons with grades as high as possible which can go into domestic consumption.

71. TENNESSEE: FIELD CROPS EXPERIMENTS, 1940. (*Tenn. Sta. Rpt.*, 1940. From *Exp. Sta. Rec.*, **87**, 3, 1942, p. 367.) Work on cotton included breeding experiments, varietal trials, research on technique, devices for measuring length and fineness of cotton fibre, and the relation of yarn structure to yarn strength.

72. TEXAS: FIELD CROPS EXPERIMENTS IN 1941. (*54th Ann. Rpt. Agr. Exp. Sta.*, 1941. Received December, 1942.) Work in connection with cotton included varietal trials, breeding and selection work, fertilizer experiments, rotation experiments, and investigations on the control of pests and diseases.

73. COTTON FERTILIZER EXPERIMENTS, 1941. (*54th Ann. Rpt. Texas Agr. Exp. Sta.*, 1941.) In fertilizer experiments at College Station the unfertilized soil produced 143 lb. lint cotton per acre compared with 276 lb. for the soil that received 400 lb. of a 6-12-4 fertilizer. Experiments over 15 years indicated that the soil, Lufkin fine sandy loam, responds to applications of nitrogen, phosphoric acid, and potash, and that a 4-12-4 fertilizer at the rate of 400 lb. per acre has given good results. In soil building studies carried out at the Temple Sub-Station it was found that Hubam clover and selected strains of cow-peas offered the best possibilities for soil-building purposes. In 1941 cotton after cotton yielded 540 lb. seed cotton per acre. However, cotton after Hubam, which was harvested for seed, gave a yield of 1,110 lb. seed cotton per acre, an increase of slightly more than 100 per cent. On this same area, root rot was reduced from 71 to 15 per cent. Cotton after Hubam, harvested for hay (with second growth turned under for green manure), gave a yield of 1,015 lb. seed cotton per acre. At Nagodoches Station Coker 4-in-1 str. 4 produced a 3-year average of 462 lb. of lint per acre in sandy soil abundantly infested with the wilt parasite. The staple length averaged $1\frac{1}{16}$ inch. In sandy soil that is abundantly infested with root-knot nematodes and the wilt parasite, the plants showed minimum injury by root-knot and only 0·3 per cent. of them wilted, while 72 per cent. of the Mebane cotton wilted in adjacent rows. Coker 4-in-1 and Coker 100 W.R. str. 39S include strong resistance to the combination of wilt and root-knot, with other superior agronomic qualities, and are promising strains for East Texas.

74. BREEDING COTTON FOR MECHANICAL HARVESTING. By D. T. Killough *et al.* (*54th Ann. Rpt. Texas Agr. Exp. Sta.*, 1941, p. 11.) "In the breeding work to combine in synthetic types those characteristics found to be best suited to mechanical harvesting, the coarser-bodied, medium-staple varieties such as Gorham's Lone Star, Western Mebane 140, Western Early, and Mebane 804-50 were used as parents. In cleaning mechanically-harvested varieties and hybrid strains prior to ginning, it was found that the coarser-bodied, medium-staple types with compact locks and fibres dense on the seed graded from one to three commercial grades higher than the softer-finer-bodied, longer-staple types, representing an increase in value of $3-10 a bale. In order to further increase the yield of the present hybrid strains these have been crossed with two new high-yielding varieties, Deltapine 14 (44-51) and Half-and-Half Selection 25. Four of the hybrid strains, Gorham's Lone Star × Deltapine 112, Mebane 140 × Ducona 30-31, Western Early × Ducona 17 strain 1, and Western Early × Ducona 17 strain 10, gave yields 11, 12, 15 and 24 per cent. higher, respectively, than the average yield of the selected high-yielding commercial varieties used as standards or checks."

COTTON IN EGYPT.

75. EGYPT: COTTON INDUSTRY, 1942-43. (*Man. Guar.*, 8/12/42.) This season cotton plantings have been reduced drastically, and cultivators have no doubt concentrated on the highest-yielding tracts, while the supply of fertilizers has been spread over a smaller area. Production is estimated to reach 3,754,000 kantars, consisting of 785,000 kantars of Giza 7, 1,127,000 of other long-stapled

varieties, 34,000 of medium staples, and 1,808,000 kantars of the shorter staples. Giza 7 thus accounts for only 41 per cent. of the long-stapled crop, compared with 64 per cent. last season, and apparently the Egyptian authorities and farmers are paying greater attention to some of the newer long-stapled cottons.

76. Egyptian Cotton. (*Cotton*, M/c, 20/3/43.) Introducing the 1943-44 Budget on March 16, the Egyptian Finance Minister said: " We have balanced the Budget without touching reserves. Our prosperity is due to influx of money into the country from abroad and money spent here by Allied troops." The Minister said the price of Egyptian cotton was formerly lower than that of American cotton, but since the Government offered to buy the crop at a minimum price the situation was reversed. Sakellaridis, Giza 7, and Ashmouni were now higher than the corresponding grades of American cotton. Cotton now offered to the Government was very small in quantity, as it fetched higher prices on the open market.

77. Egyptian Cottons. (*Man. Guar.*, 13/3/43.) Reports recently received from Egypt are to the effect that Karnak—formerly known as Giza 29—is now coming into full production, and that the increase in the acreage planted to this variety has been achieved mainly at the expense of Giza 7. As a fairly large crop of Malaki—formerly known as Giza 26—has also been grown, and a new high-quality cotton, Giza 39, is being developed, it seems clear that the better range of Egyptian cottons will be well cared for in the near future. This may cause some difficulty for users of Giza 7, who need it for the lower range of counts, and may not be prepared to use a cotton as good or as expensive as Karnak. Such spinners may find that a further new type is worth their attention; this is Giza 36, officially described as a medium-staple cotton. The use of this description for this cotton indicates the strength of the tendency for the general run of the qualities grown in Egypt to improve. Giza 36 is both longer and spins a stronger yarn than Giza 7, which has generally been considered as a long-staple cotton.

From the agricultural point of view, as distinct from the textile one, Giza 36 has perhaps more in common with Ashmouni and Zagora than with the older long-stapled varieties. For one thing, it appears to grow best in the southern Delta region, where the principal variety cultivated has recently been Zagora. The agricultural qualities of the new Giza type are remarkable, its yield per acre, ginning outturn, and earliness of maturity all being excellent, and in any circumstances these would have stimulated a rapid increase in its cultivation, but a further influence in the same direction was provided by the Egyptian Government when it decided to prohibit the growing of Zagora this year. It is expected that the seed available for this year will be enough to plant some 20,000 or 25,000 feddans with Giza 36, while for 1944 a further big increase is expected, with keen competition between this strain and Karnak.

The agricultural authorities in Egypt are not losing sight of the possibility that a demand may arise for a still cheaper Egyptian type of good staple. The search is being continued for a suitable type falling between Ashmouni and Giza 7 as regards length of staple, but with such a heavy yield that it could be sold at much the same price as Ashmouni.

COTTON IN OTHER FOREIGN COUNTRIES.

78. Argentine Cotton Seed: Quality Control. By N. Reichart. (*Bol. Mens.* 81-82, Junta Nac. del Algodon, Buenos Aires, 1942. From *J. Text. Inst.*, November, 1942, A493.) Measures for the improvement of cottonseed for sowing in the Argentine Republic are mentioned and charts are given showing quantities of authorized and certificated seed for sowing produced in the various regions in the 1940-41 season, and the classification of the seed according to germinating

power. The average germinating power of authorized seed was 72·33 per cent. In Resistencia 43·68 per cent. of the certificated seed produced had a germinating power of over 90 per cent.

79. COTTON CULTIVATION IN SANTIAGO DEL ESTERO PROVINCE. By A. O. Castro. (*Bol. Mens. Junta Nac. del Algodon*, No. 78. Buenos Aires, 1941, p. 802. From *Summ. Curr. Lit.*, xxii., **6**, 1942, p. 131.) The possibilities of developing cotton cultivation in the province of Santiago del Estero are discussed. The climate and soil are particularly suitable and irrigation systems are being developed. Yields are high, and even in 1937, when this district experienced a severe drought, amounted to 126 kg. of fibre per hectare, compared with 88 kg. in the Chaco and 140 kg. in Corrientes. The cotton is superior in whiteness, length and strength to that produced in other parts of the country. The variety Acala (Blue Tag) is the most suitable for the Santiago region. At present the poor cultivators are dependent on dealers from whom they too frequently receive unfair treatment, and the formation of co-operatives and improvements in the method of subdivision of the land are needed. Education of growers in methods of cultivation and precautions to be taken in harvesting will be necessary.

80. COTTON IN TUCUMAN. By W. E. Cross. (*Mem. An. del año* 1941. From *Pl. Bre. Abs.*, xiii., **1**, 1943, p. 21.) A number of crosses have been made between local and imported cottons. Selections of Tucuman C1 and of Lightning Express have proved promising. Studies of mutations, both natural and colchicine-induced, are in progress.

81. BOLETIN MENSUAL. (Min. de Agr., Junta Nac. del Algodon, Buenos Aires, 1942.) *Bulls.* 85-6, 87-8, 89-90, 1942, contain the following among other papers in Spanish: "Fixing of maximum prices for cotton spinning"; "The adoption of a standard for cottonseed destined for the industry"; "The moisture content of cottonseed in relation to its germinative capacity and the presence of *Aspergillus wentii*" (M. Di Fonzo); "Textiles consumption in the United States in 1941"; "The establishment of a cotton spinning and weaving factory in Santiago del Estero approved by Congress"; "Activity of cotton-spinning mills in Argentina in 1941 and their consumption of raw cotton"; "Maximum prices provisionally fixed for various types of cotton yarn"; "The industrial uses of cottonseed in 1941"; "Study of the chemical composition of cottonseed and of cottonseed cake" (E. F. Paulsen); "The multiple uses of cotton." Statistics are also included of acreage, production, prices, exports, etc.

82. BRAZIL: COTTON PRODUCTION, 1941-42. (*Bd. of Tr. J.*, 28/11/42.) According to statistics recently published by the Bank of London and South America, Ltd., in London, Brazil ranked as the world's fourth largest cotton producer for the 1941-42 season with 2,034,000 bales out of a total world production of 26,087,000 bales. Production in the other five principal countries was as follows: United States, 10,599,000 bales; India, 4,640,000; Soviet Union, 3,000,000; Egypt, 1,650,000; and China, 1,000,000.

83. BRAZILIAN COTTON. (*Cotton*, M/c, 23/1/43.) Reports from Rio de Janeiro, dated November 6, 1942, state that cotton prices have been firmer during the past quarter due to the expectation of smaller crops as a result of adverse weather, and current quotations are on an average about 40 per cent. higher than those ruling at this time last year. The outlook appears slightly more favourable owing to the substantial volume of exports going to Spain, Great Britain, and Sweden, and the increased consumption of the Brazilian mills. Despite the reduction of 43 per cent. in exports of Paulista cotton during January-September, 1942, compared with the like period of last year, it is anticipated that distribution to all markets will reach a total of 245,000 metric tons this season (out of a total Paulista crop of some 295,000 tons), leaving a possible stock of 140,000 tons to be

carried forward to the next season. The latest official estimate of the crop in the Northern States of Brazil is 85,000 tons, compared with the last estimate of 106,000 tons for the 1941-42 season. This substantial reduction in the crop is reported to be seriously affecting conditions in the interior of the States concerned, and in consequence large numbers of workers are migrating to the Amazon regions to gather rubber. It is reported that the Department of Agriculture in the State of Parahyba has been experimenting with a very long staple cotton said to be almost equivalent to the best Egyptian.

84. Die Kultur der Baumwolle in Brasilien. By E. Morgenroth. (*Forschungsdienst*, **13**, 1942, p. 341. From *Pl. Bre. Abs.*, xiii., **1**, 1943, p. 55.) In São Paulo 4 varieties are cultivated, all selections from the Upland varieties Texas Big Boll and Express. In the north-east the perennial variety Moco, with lint length of 35-45 mm., is grown. Seed production is exclusively in the hands of the State. The various cotton pests in Brazil are discussed.

85. Textile Fibres: Production in Brazil, and their Uses. By C. E. Nabuco de Araujo, Jr. (*Chem. and Eng. News*, **20**, 1942, p. 1296. From *Summ. Curr. Lit.*, xxii., **24**, 1942, p. 581.) Cotton production in Brazil increased from an average of 119,000 tons annually in the period 1925-29 to 521,600 tons in 1941. Rayon production increased from 32 tons in 1926 to 8,000 tons in 1941. Various fibres, such as piaçava, caroá, tucum, curauá, paco-paco, etc., are produced in Brazil and have been shown to be useful for many industrial purposes. The cultivation of ramie, jute and sisal has recently been started in the country. A table showing the botanical names and properties of the native fibres is given. Brazil is exporting to other South American countries not only raw fibres but also fabrics produced locally, as well as some cloths in which caroá and other native fibres are mixed with cotton.

86. China: Government's Plan to Stabilize the Price of Cotton. (*Cotton*, M/c, 27/3/43.) The Ministry of Economic Affairs at Chungking recently announced a plan to purchase about 84,000 bales of cotton in two unoccupied Provinces (Shensi and Honan) in North China. This cotton will be manufactured by cotton mills operating on a contract basis, and the finished goods are to be sold by the Government to consumers at less than current market prices. This is part of a Government project to provide adequate supplies of necessities to Government employees and needy civilians. The programme is designed to curb rapidly rising prices for cotton goods and other necessities. Previous reports placed the Free China cotton crop in 1941 at around 1,200,000 bales. Cotton mills in Free China are believed to be operating approximately 260,000 spindles.

87. Paraguay: Cotton Industry, 1942. (*Cotton*, M/c, 20/2/43.) The crop amounted to some 31,912 bales. Consumption by the Paraguayan mills has steadily increased during the last few years. After a seed reserve of about 1,200 metric tons was set aside, 11,500 tons of cottonseed remained for crushing, the yield of cottonseed oil being estimated at 1,265 tons. Cottonseed oil and peanut oil have maintained a prompt and ready sale in Paraguay for the last eighteen months, and a mixture of the two is sold for cooking and other purposes.

88. Peru: Cotton Crop, 1942-43. (*Cotton*, M/c, 27/3/43.) Reports from Peru state that abnormally low temperatures and unsuitable soil conditions delayed cotton planting, and replanting was necessary, in some cases as many as three times. By decree of November 21 last, the Ministry of Agriculture is authorized to establish an office to supervise the 30 per cent. acreage reduction programme instituted on July 24, 1942.

89. Peru: Memoria Anual de 1940 del Jefe del Departamento de Investigaciones de Algodon y Cereales. By T. Boza Barducci *et al.* (*Est. Exp. Agr. de la Molina*, Lima, Peru. In Spanish with English summary.

Received 1942.) *Cotton :* Results of selection work carried out during 1939-40 are reported and show by means of tables and diagrams the progress achieved in connection with the work on the improvement of the most important Tanguis cotton characters, and on the increasing resistance of Tanguis to *Verticillium* wilt. The origin of strain LM No. 7-35—actually being multiplied—is explained, and its principal characters described. In cotton growers' opinion this strain is much earlier, higher yielding, and of better quality lint, which fetches higher premiums on the market, than ordinary Tanguis. The characters of strains CN-LM, C-LM, CB-LM and P-LM are noted, and since type CN-LM is outstanding all future work will be carried out with it. Interlinear, intervarietal and interspecific crosses are next described, the object being to combine certain Egyptian cotton characters, and especially its scant vegetative and radicular growth, with lint characters from Tanguis cottons, in a type which would be suitable for cultivation in the Northern Peruvian coastal region. Special mention is made of the value of certain Tanguis × Sakel crosses now in F_6, the lint of which, in the opinion of experts, would command high premiums. Work is discussed in connection with: Determination of the chromosome numbers of the species *G. Raimondii* Ulbr. and its hybrids with 13 and 26 chromosome species; production of cotton mutants by colchicine; cytogenetical investigation of a cotton species from Tumbes. Reference is also made to experiments on (*a*) Percentage of humidity in seed cotton during the picking season, with the aim of introducing mechanical drying systems in Peru for improving ginning; (*b*) Pre-treatment of cottonseed; (*c*) Soil temperatures during the growing season with reference to wilt attack, and to root development in relation to resistance to this disease; (*d*) Disease and pest resistance of the wild and cultivated cotton plants in the Type Collection of 442 specimens.

[*Cf.* Abstr. **487**, Vol. XVIII. of this Review.]

SOILS, SOIL EROSION, AND MANURES.

90. THE IDEAL SOIL. (*Nature*, CL. 3792, 1942. Abstr. in *Trop. Agr.*, xix., **12**, 1942, p. 244.) In a paper by Dr. Hugh Nicol the ideal soil is said to be composed not of discrete mineral grains but of crumbs or aggregates. These include colloidal matter of two kinds—mineral colloids and organic colloids. The latter may be partly humus, which may be regarded as an *end-product* of the microbial decomposition of organic matter. In a fertile soil, the organic matter includes a sticky material less inert than humus, and resulting from the recent decomposition of organic matter. This organic cement sticks the grains together into small crumbs which have the most desirable physical properties. It is not the microbes which are important in soil, but the products of their recent activity are important. There is reason to believe that the plant and the soil with which it is in contact form a practical continuum, this contention gaining weight from the work by H. Jenny and R. Overstreet on ionic exchange. If plants are grown in mixtures of sand and calcium clay, the roots accumulate calcium ions, whereas the clay particles gain in adsorbed hydrogen ions. Contact exchange is postulated to take place only when the (cation) oscillation spaces of particles overlap; the particles may be both clay, or one may be a root surface, both being negatively charged. Contact intake is difficult to investigate on account of a presumed high gradient of carbon dioxide in the neighbourhood of a root, but there is very suggestive evidence of a contact depletion, so that the theory of contact exchange of ions may be regarded as having made a promising beginning. There is yet no evidence for contact exchange of anions. No contact jumping of cations could be found between roots and positive iron hydroxide sol.

91. SOIL ORGANIC MATTER: ITS NATURE AND IMPORTANCE. By S. A. Waksman *et al.* (*New Jersey Sta. Circ.*, 422, 1942. From *Exp. Sta. Rec.*, **87**, 4, 1942,

p. 483.) A popular treatment of the practical aspects of the subject, mostly in the form of questions and answers.

92. OBSERVATIONS ON SOIL METHODS—PART II. By W. J. Blackie and A. I. Biggs. (*Agr. J. Dpt. Agr. Fiji*, xiii., **3**, 1942, p. 83.) Observations are recorded in connection with recent methods for the determination of phosphorus and potassium in soils, and descriptions are given of reliable techniques using hydrochloric acid extracts of tropical soils.

93. SOLUBLE MATERIAL OF SOILS IN RELATION TO THEIR CLASSIFICATION AND GENERAL FERTILITY. By M. S. Anderson *et al.* (*U.S. Dpt. Agr. Tech. Bull.* 813, 1942. From *Exp. Sta. Rec.*, **87**, 6, 1942, p. 770.) The studies reported include comparisons of soil solutions variously prepared from representative series of some of the important great soil groups and of base-exchange relationships of these same soils. Data upon the relation between soil solutions and plant response to alteration of the water-soluble components, after alteration of important soil types has taken place through cultural practice, are also presented. Following an outline of the plan of work, the bulletin gives a description of the virgin soils studied and takes up factors affecting solubility of virgin soils, electrical-conductivity measurements, chemical composition of soil solutions variously prepared from virgin soils, soluble material in relation to depth in a soil profile, interrelationships of constituents, soluble material in cultivated soils in relation to crop growth, relation between total chemical composition of soil and the water solution, and soil solution as a medium for plant growth. Soils of the Podzol, Chernozem, Prairie, Gray-Brown Podzolic, Lateritic, and Red Podzolic groups were investigated and are reported upon in detail both qualitatively and in terms of tabulated numerical data.

94. A MEDIUM FOR THE RAPID CULTIVATION OF SOIL ACTINOMYCETES. By E. J. Bottcher and H. J. Conn. (*J. Bact.*, xliv., **1**, 1942, p. 136. From *Rev. App. Mycol.*, xxi., **11**, 1942, p. 502.) At the New York (Geneva) Agricultural Experiment Station the authors have obtained rapid growth of eleven cultures of soil Actinomycetes on a medium consisting of cotton soaked in 5 ml. glycerol, 2 gm. yeast extract, 1 gm. potassium nitrate, and 1,000 ml. water.

95. THE OCCURRENCE OF BACTERIOSTATIC AND BACTERICIDAL SUBSTANCES IN THE SOIL. By S. A. Waksman and H. B. Woodruff. (*Soil Sci.*, **53**, 3, 1942, p. 233. From *Exp. Sta. Rec.*, **87**, 4, 1942, p. 486.) Summarizing the results of various studies in this field (20 references), it has been found possible, using proper extracting agents (ether), to demonstrate that soils contain substances of the actinomycin type which inhibit growth of certain bacteria in culture media. These substances when isolated from the soil have not only a bacteriostatic but also a bactericidal action on certain bacteria. Added to the soil in concentrations much higher than would be necessary to inhibit bacteria in artificial media, actinomycin is rendered ineffective against these bacteria. Soils, peats, and composts contain a substance (a-humus) that reduces considerably the activity of actinomycin, even in artificial media.

96. THE USE OF THE MICROMETRIC AND OTHER METHODS FOR THE EVALUATION OF SOIL STRUCTURE. By C. L. W. Swanson and J. B. Peterson. (*Soil Sci.*, **53**, 3, 1942, p. 173. From *Exp. Sta. Rec.*, **87**, 3, 1942, p. 333.) The authors describe a micrometric method for the measurement of pore spaces in thin sections of soil. Projection of the microscopic images (174X) on a graduated scale facilitates the measurement of the pore spaces. For section cutting, the soil was embedded in synthetic resin media. The micrometric method of determining pore space was compared with a moisture-tension method which yielded pore space values comparable to those obtained by the micrometric method for a cultivated and a virgin soil. A modified Coile volume-weight

sampling tube was used for obtaining undisturbed cores of soil samples for the determination of capillary and non-capillary porosity. It appeared that on wetting, the size of the pores was reduced by the swelling of the soil, and that this swelling effect was least in the larger pores. When the pore space relationships of a cultivated and a virgin surface soil horizon of Marshall silt loam soil were studied, the results showed that, for the range (0·0117-1·17 mm. diameter) of pore sizes measured, the virgin soil had twice the volume of pores and a higher percentage of large pores than did the cultivated soil. An advantage of the microscopic study of soil pore space and structure in thin sections of undisturbed soil was found in the fact that not only quantitative but qualitative observations can be made of such properties as distribution, sizes, volume, and shapes of pores. The direct observation of the true structural pattern of the soil often yields information necessary for the correct appraisal of the relationships between soil structure and such other natural phenomena as infiltration capacity and soil pore space. Combined with soil moisture studies it provides additional means for the interpretation and understanding of natural soil processes.

97. The Determination of Selected Chemical Characteristics of Soil which affect the Growth and Composition of Plants. By G. R. Noggle and F. L. Wynd. (*Pl. Phys.*, **16**, 1, 1941, p. 39. From *Exp. Sta. Rec.*, **87**, 4, 1942, p. 478.) The authors offer a systematized and rather complete compilation of methods for the sampling, the chemical analysis, and the physical examination of soils, and the calculation of the results in terms of the constituents, properties, and relationships affecting the physiology of the plant. Volume weight rather than an arbitrary assumption of the weight of an acre-foot of soil is taken as the basis for expressing analytical data in terms of pounds to the acre. Under the heading of water relationships are given methods for moisture and water-holding capacity determinations and for calculating the percentage of the water-holding capacity under field conditions. Under the heading of acidity relationships, *p*H and lime requirement are to be determined. Colloidal relationships measured include total base exchange capacity, total replaceable bases, percentage base saturation, replaceable hydrogen, individual replaceable bases, exchangeable hydrogen by titration (based in part on Parker's method), and organic colloid base exchange capacity (Olson and Bray's procedure). The nitrogen determinations included total nitrogen, ammonia, nitrate, and organic nitrogen. Systematic separations of the important elements in water extracts and in dilute acid extracts are also provided for, and under the general head of carbon are grouped methods for determining carbonates, organic carbon by combustion and by Walkley and Black procedure, and loss on ignition. Analytical methods recommended for examination of the extracts included a volumetric method for determining potassium as cobaltinitrite, essentially that of Wilcox, and two gravimetric methods—a method based on Kolthoff's zinc uranyl acetate reagent for sodium determination and a modification of the Denigès colorimetric method for phosphates.

98. A Rapid Method for Determining Soil Moisture. By J. S. Papadakis. (*Soil Sci.*, **51**, 4, 1941, p. 279. From *Exp. Sta. Rec.*, **86**, 6, 1942, p. 732.) Place 50 gm. of soil in a flask marked at about 100 c.c. Add tap water, shaking at the same time in order to eliminate soil air. Make up to the volume and weigh. Subtract from this weight that of the flask made up to the same volume with water alone. The oven-dry weight of the soil is the difference multiplied by a factor determined once for each kind of soil by oven drying a sample and dividing the oven-dry weight by the aforementioned difference. The factor varied from 1·563 to 1·667 for 17 soils tested.

99. A Fixation Method for Determining the Phosphorus and Potassium Requirements of Soils. By E. R. Purvis and J. M. Blume. (*Soil Sci. Soc.*

Amer. Proc., 5, 1940. From *Exp. Sta. Rec.*, 87, 6, 1942, p. 774.) Laboratory and field data show the relationship existing between the amount of phosphorus and potassium absorbed by a soil from a standard solution and the response of various crops to fertilization of the soil with these elements. An absorption method for determining the phosphorus and potassium requirements of soil is described.

100. Prospects for Soil Conservation. By G. V. Jacks. (*E. Afr. Agr. J.*, October, 1942, p. 73.) The world has awakened during the last few years to the dangers threatening it from soil exhaustion caused by short-sighted methods of agriculture, and in this article by the Deputy Director of the Imperial Bureau of Soil Science, Rothamsted Experimental Station, the whole matter is described with a freedom from technicalities that will make it intelligible to every reader. During the last century wherever new land has been opened up for settlement there have been practised kinds of agriculture which have resulted in a rapid depletion of the natural fertility of the soil. The first symptoms are failing yields, but a later and quite unexpected phase of soil exhaustion has been the more or less complete disappearance of the soil itself. A fertile soil, wherever it is formed, has many of the properties of a sponge—it can absorb quantities of water, and possesses considerable internal cohesion. An infertile and exhausted soil loses this water-absorbing capacity and cohesiveness, and breaks down to a mass of separate particles, in which condition it is readily washed away by water or blown away by wind. In this way, as a result of the depletion of a mere fraction of the total soil fertility, enormous areas mainly in North America, Africa, and Australia have been denuded of soil and are now to all intents and purposes barren wastes. The current wastage of land through this so-called soil erosion is not immediately serious for the world as a whole, since there is still plenty of good land available for everyone, but it is becoming serious in the United States and in territories in South and East Africa. Summary figures of a national survey made in the United States in 1934 illustrate the extent of the damage done by soil erosion mainly within the past forty years. Of the total land area 14 per cent. had lost three-quarters to all of the soil, 42 per cent. one-quarter to three-quarters, and 30 per cent. (much of it unsuitable for agriculture) was uneroded. Apart from the loss of productive soil, incalculable damage has been done by chronic flooding of the main rivers, progressive desiccation of the land, and the profound disturbances to the normal régime of ground waters that are produced by the disappearance of the absorbent surface soil, and adversely affect agriculture even where no erosion has occurred. The cause of soil erosion is often given as the destruction of the natural vegetation which normally affords the soil adequate protection from the erosive action of rain and wind. This is correct up to a point, but the real cause of erosion is the practice of an agriculture which does not take full account of the natural limitations of the environment and causes soil exhaustion which is the invariable precursor of soil erosion, and the only certain cure is to utilize the land in a manner which maintains, and preferably increases, its fertility. Such a type of land utilization is general in the highly farmed countries of Western Europe, where, despite prolonged and intensive cultivation, the soils are probably now capable of greater and more sustained production than at any previous time. In the eroding countries of the New World comparable harmony between agriculture and the environment does not exist. In these countries the evolution of agriculture has been governed by opportunities—by the potentialities rather than by the limitations of the environment. The latter, however, are now making themselves felt. Agriculture must either develop into a process that increases the fertility of the soil, or cease altogether. The factors, chief among which is the climate, that determine how the soil must be cultivated so as to increase its fertility, are still largely outside human control. On the other hand, the factor

determining how the land actually is utilized is primarily economic. In general, men will always cultivate the land in the way that gives them the greatest economic advantage, and soil-exhausting agriculture tends to be easier and more immediately profitable than soil-conserving agriculture, which implies investing something in the land to pay a dividend at a later date. Consequently, although the measures required to stop soil erosion and build up soil fertility are simple and well known, they are not applied on a scale commensurate with the task unless and until the economic conditions of a country make it more profitable to conserve than to exhaust the soil. The first essential step in the soil-conserving agricultural revolution in Britain—the enclosure and pasturing of exhausted arable land—was promoted by the prosperity of the wool trade and the contemporary depression of the grain trade. In recent years the United States has apparently turned the corner from soil-exhausting to soil-conserving agriculture as a result of the disappearance of the export trade for soil-exhausting crops. The Agricultural Adjustment Administration set up to reduce the acreage of these unsaleable crops has become a powerful agent in encouraging the cultivation in their place of soil-conserving crops. The necessary requisites, then, for the accomplishment of soil conservation in an eroding region are, first, an economic system under which it is more profitable to increase than to destroy soil fertility, and second, and complementary, a form of society that will co-operate in the working of the economic system. Given these—they are complex functions of the environment—permanent soil-conserving agriculture follows automatically.

101. CONSERVATION IN A COUNTY'S "COMEBACK." By F. N. Farrington. (*Agr. Eng.*, **22**, 10, 1941, p. 355. From *Exp. Sta. Rec.*, **87**, 2, 1942, p. 187.) Striking results of a conservation programme applied to an area considered to be approaching a worn-out condition are described. Terracing and ploughing under of winter legumes are credited with the greater part of the marked increases in crop and livestock production. An illustration shows a field abandoned as worthless for 15 years, then terraced and planted to Austrian winter peas, which were ploughed under and followed by cotton. The last-named crop then made a bale to the acre.

102. VARIABILITY OF ERODED MATERIAL. By C. S. Slater and E. A. Carleton. (*J. Agr. Res.*, **65**, 4, 1942, p. 209.) The present study was started to clarify certain interrelationships in the variability of eroded material and, more specifically, to determine why organic-matter content fails to follow textural analysis. The results are summarized as follows: A series of soil losses and the corresponding plot soils have been analysed texturally and for their organic-matter content. Since rainfall was light, soil and surface conditions, rather than intensity and duration of rainfall, appeared to govern the textural composition of the eroded material. Under conditions favourable to infiltration and downward movement of fines, eroded material has been produced that is coarser in texture than the corresponding soil; under conditions of greater impermeability, eroded material has been produced that is finer in texture than the corresponding soil. These differences tend to disappear as erosion increases and the composition of the eroded material approaches the composition of the soil. Argument has been advanced to show that a disproportionate removal of fines need not be more serious than the removal of the same amount of soil in its total. Irrespective of texture, eroded material has been shown to be somewhat higher in organic-matter content than the eroding soil, especially where small runoffs are incurred. This anomaly has been shown to be the result of organic debris that is removed preferentially by the eroding process. If the effect of organic debris is discounted, colloidal material removed by erosion has essentially the same organic-matter

content as the colloidal material of the eroding soil. The textural separates of a soil are essentially identical with comparable separates from its eroded material, and, except for deviations due to organic debris or temporary physical conditions, all properties in which eroded material may differ from the soil must be the direct result of the relative proportions of separates that are included in the material.

103. Fate of Fertilizer when Applied to Soil. By R. Coleman. (*Miss. Farm Res.*, **5**, 4, 1942, p. 7. From *Sta. Exp. Rec.*, **87**, 3, 1942, p. 344.) According to this brief popular statement of the more elementary known facts concerning the behaviour of fertilizers in soils, most of the phosphate and much of the potassium applied will be retained and may benefit the crop of a succeeding season, but all nitrogen applied this year will be gone before next spring. A liberal application of lime should supply calcium to crops for several years.

104. Using Crop Residues for Soil Defence. By F. L. Duley and J. C. Russel. (*U.S. Dpt. Agr. Misc. Pubn.* 494, 1942. From *Exp. Sta. Rec.*, **88**, 1, 1943, p. 24.) An illustrated publication on the utilization of crop residues as a means of conserving soil and water. Crop residues are defined to include materials such as stubble, straw or stalks of various crops, or even old weed growth. Adjustments and modifications of farm equipment to carry out the programme for effective utilization of crop residues are described in detail. Data on the effect of the various treatments on soil and water losses and crop yields, soil moisture, and soil structure are given.

105. Cotton Plant: Fertilizer Treatment. By D. M. Sekirin. (*Voprosy Fiz. Khim. Melioratsŭ Pochv i Udobreniya Khlopchatnika*, 79, 1939. From *Summ. Curr. Lit.*, xxxiii., **2**, 1943, p. 25.) A fractional addition of fertilizers is recommended to ensure for cotton plants the required amount of the elements during all phases of their development. Before blossoming, N and P are consumed by cotton plants in a 3·5 : 4·1 ratio. During the blossoming period this ratio is displaced slightly in the direction of P, and it reaches 2·5 : 1·0 toward the ripening period. In April and May there is a maximum accumulation of ammonia in the soil. It is recommended to add ammonium nitrate instead of ammonium sulphate as well as a sufficient amount of K fertilizers. A considerable accumulation of nitrates is observed in the upper layers of the soil (0-5 cm.) during the summer period and in the subtillage layer (40-100 cm.) at the end of the vegetation period. Phosphorus is contained mainly in the 0·25 cm. horizon. Addition of elements such as B (2·8 kg. of borax per hectare) and Mn (111 kg. of manganese slime per hectare) increases the yields of fibres and seeds by 11-13 per cent.

106. Delta Fertilizer Studies Emphasize Need for Nitrogen. By R. Kuykendall. (*Miss. Farm Res.*, **5**, 1, 1942. From *Exp. Sta. Rec.*, **86**, 6, 1942, p. 748.) Effects of nitrogenous fertilizer on the cotton crops when applied for some years from various sources and on various soil types, and some of the general tendencies, are indicated.

107. Phosphate applied in Narrow Bands for Better Results. By R. Coleman. (*Miss. Farm Res.*, **5**, 1, 1942. From *Exp. Sta. Rec.*, **86**, 6, 1942, p. 749.) Placing the phosphate 2·5 inches to the side and 2 inches below the seed either in narrow bands or by hill dropping gave much better results for cotton than did any less concentrated placement in experiments in 1939-41. A badly eroded Atwood sandy loam was used in the 1939 test and Paden silt loam in those of 1940 and 1941.

108. The Physiological Rôle of Selenium in Plants. (*Nature*, CL. No. 3,792, 1942. From *Trop. Agr.*, xix., **11**, 1942, p. 224.) The following is abstracted from an article by Dr. Hugh Nicol. " From the point of view of

essentiality and uptake, one of the most interesting chemical elements is selenium. Its physiological rôle has been recognized only in the last decade, owing to the investigation of seleniferous soils. These soils have only a small selenium content, but cover vast areas in North America. Marco Polo recorded poisoning of animals in China which has since been shown to be referable to a seleniferous soil. A similar condition in Ireland remains unexplained. In their reactions to selenium, plants may be divided into four groups: (1) those which require selenium, (2) those which can tolerate large amounts in their tissues, (3) those which can tolerate small amounts but are poisoned by large amounts (these include crop plants such as wheat), and (4) those which practically exclude it. The last group comprises some native prairie grasses. The first group is formed by some species of the botanically varied genera *Astragalus*, *Oonopsis* and *Stanleya*; for these selenium is an essential element, and the concentration in the dry matter and in the seed may surpass 3,000 parts per million. Recently an amino-acid complex containing both selenium and sulphur has been isolated from grain and from *Astragalus*. Plants for which selenium is essential, such as certain species of *Astragalus*, will, of course, grow naturally only on seleniferous soils (the converse does not hold). Hence they serve as an interesting introduction to the subject of 'indicator' plants—that is, plants which by their presence or mode of growth indicate soil conditions."

STATISTICAL TREATMENT, CULTIVATION, IRRIGATION, GINNING, ETC.

109. Randomized Block Experiments: Statistical Treatment. By R. A. Fisher. (*Ann. Eugenics*, **11**, 1942, p. 341. From *Summ. Curr. Lit.*, xxiii., **5**, 1943, p. 136.) When making experimental comparisons of large numbers of factors in randomized blocks, it is often convenient to have comparatively small blocks, with only a few of the factors in each block. Such an experiment can be arranged to give valid estimates of the main effects of the factors and the chief interactions, leaving only the unimportant higher order interactions confounded with block differences. The theory of such arrangements is discussed and it is shown that if the number of experimental units ("plots") in a block is n, arrangements can be found for n-1 factors such that all confounded interactions involve three or more factors. Arrangements are given for up to fifteen factors.

110. Random Sampling Distributions. By A. E. Treloar. (Burgess Pubg. Co., Minneapolis, 1942. $2.25. Mimeographed. From *Pl. Bre. Abs.*, xiii., **1**, 1943, p. 95.) The experimental scientist is frequently faced with the problem of interpreting a short series of observations by the method of statistics. In general he will have insufficient knowledge of mathematics to follow the deduction of the methods he finds it necessary to use. One course open to him is to use the technique of making statistical tests without understanding the reasons why. The author of the book under review objects to this course, and shows that the geometric method, which cannot in general give the definitive equations of random sampling distributions, can be effectively used to describe the properties of the distributions which enable them to be of use for the interpretation of data. After a chapter on the basis of statistical inference, he deals with the random sampling distribution of means and differences between means, emphasis being placed on the approach to normality of the distribution of the mean of a sample from a non-normal population with increasing size of the sample. The next three chapters deal with the sampling errors of the standard deviation and the comparison of standard deviations by Fisher's "z" distribution. There follow chapters on Student's distribution

and its use, the analysis of variance, the sampling errors of the correlation coefficients and the testing of regressions. It is felt that less space could have been spent on the distribution of means, etc., and more, for example, on the analysis of variances. The diagrams which illustrate the derivation of the distributions are, in general, very clear. A short, inadequate description of estimation by the Method of Maximum Likelihood is given, and the special advantages of this method are slurred over.

111. A Generalized Analysis of Variance. By F. F. Satterthwaite. (*Ann. Math. Statist.*, **13**, 1942, p. 34. From *Pl. Bre. Abs.*, xii., **4**, 1942, p. 221.) With a view to promoting more extended and varied use of the analysis of variance in its practical applications, this paper has been written to examine the basic principles of the method to demonstrate how designs (other than the present well-known simple standard types) may be constructed and applied to almost any data which can be assumed to be normally distributed.

112. The Design of Plot Experiments for Measurement of Run-off and Erosion. By A. E. Brandt. (*Agr. Eng.*, **22**, 12, 1941, p. 429. From *Exp. Sta. Rec.*, **86**, 6, 1942, p. 746.) In this factorially arranged control plat experiment, the main effects of the three variables are measured with the same precision as though the entire experiment had been devoted to each, and the possible interactions between them are measured with full precision. "If a research worker should attempt to answer all of these questions by letting but one factor vary at a time, he would be lost in a maze of experiments." The principles involved in the design of such an experiment and the successive steps of its development are discussed in some detail.

113. A Note on the Shape of Blocks in Field Experiments. By R. Narain and A. Singh. (*Ind. J. Agr. Sci.*, x., **5**, 1940, p. 844.) The results of a soil-uniformity trial with *chari* grown at the Rawalpindi Agricultural Station have been presented and considered in a number of ways. Fertility contours indicating variations in soil fertility met with on this piece of land have been drawn. The drift of soil fertility indicated by the fertility contours has been confirmed by analysing the plot yields in the form of a Latin square. The suggestion that the precision of the experiment could be considerably increased if the blocks were made as compact as possible has been examined in detail, and it has been shown that compactness does not always result in the increase in precision. The advantage accruing from the provision of compact blocks depends upon the fact that the land within these is likely to be more uniform than within a block which is long and narrow in shape. This, however, is not always the case. If, therefore, by making the blocks compact different levels of soil fertility are introduced within any one of them the advantages of compactness will be considerably offset. It has been shown that the greatest precision in the conduct of the trial is obtained by keeping the land within the blocks as uniform as possible irrespective of the shape of the individual blocks.

114. Recent Advances in Mathematical Statistics. By H. O. Hartley. (*J. Roy. Statist. Soc.*, **103**, 1940, p. 534. From *Pl. Bre. Abs.*, xii., **4**, 1942, p. 207.) An extensive bibliography of work on the theory and applications of statistics.

115. Treatment of Cottonseed. (*54th Ann. Rpt. Miss. Exp. Sta.*, 1941, p. 30.) An increase in yield of seed cotton from 67 to more than 420 lb. per acre at a cost of less than 25 cents is reported from a 10-year study of cottonseed treatment. Five per cent. ethyl mercury phosphate (New Improved Ceresan) and ethyl mercury chloride (2 per cent. Ceresan) are two good cottonseed treatment dusts, and the cost of treatment ranged between 12 and 24 cents per acre. Cottonseed treated at the gin and stored in either cloth or burlap bags was not harmed by the treatment or method of storage.

116. El Tratamiento de la Semilla del Algodonero con Productos Anticriptogamicos. By M. A. di Fonzo. (*Bol. Junta Nac. Algodon*, 81-82. Buenos Aires, 1942. From *Rev. App. Mycol.*, xxii., **2**, 1943, p. 64.) Full details are given of laboratory and field experiments (the latter in two widely separated districts of the Argentine, Chaco and Santiago del Estero) to determine the value of cottonseed treatment for the control of fungal diseases, especially those due to *Rhizoctonia solani*, *Glomerella gossypii*, and *Bacterium malvacearum*. In both localities the best results were given by granosan No. 4 (8 gm. per kg.) closely followed by Abavit 192 (universal), with germination percentages of 73·2 and 68·8, respectively, in Chaco, and of 46·6 and 45·3, respectively, in Santiago del Estero, the corresponding figures for the two controls in each series being 58·2 and 46·3 and 41·4 and 40, respectively. Another factor liable to reduce the germinability of cottonseed, the moisture content of which under local climatic conditions averages 12 per cent., is infection by organisms of the yellow mould (*Aspergillus wentii*) group. There was no reduction of germination in seed with an 8·5 per cent. moisture content after 4 months' contact with a fungicidal dust (4 to 12 gm. per kg.). (*Cf.* following abstract.)

117. La Humedad de la Semilla del Algodonero Relacionada con su Poder Germinativo y con la Presencia del *Aspergillus wentii*. By M. A. di Fonzo. (*Bol. Junta Nac. Algodon*, 85-86. Buenos Aires, 1942. From *Rev. App. Mycol.*, xxii., **2**, 1943, p. 64.) In laboratory experiments to determine the relationship of infection by *Aspergillus wentii* to the reduction of germinative capacity in cottonseed (Acala Blue Tag and Delta 11 A) of varying moisture contents, the fungus was found to assume an actively injurious form when the moisture content ranged from 11·2 to 15·2 per cent. Humidity alone was shown to be an important contributory factor to the loss of germinability in cottonseed, one lot of which, with an initial germinative capacity of 95·7 per cent., lost 33·5 per cent. in 10 days in an Erlenmeyer flask containing sulphate to saturation (98 per cent. humidity), while the addition to the flask of inoculum of *A. wentii* resulted in a decline of 74·5 per cent. of germinative energy during the same period. Seed treatment with an approved fungicidal dust is a simple, economical and effective method of protection against damage from this source.

118. Growth Substances in the Treatment of Cottonseed. By H. E. Rea. (*54th Ann. Rpt. Texas Agr. Exp. Sta.*, 1941, p. 16.) Extensive use was made of growth substances, especially indolebutyric acid, in treatment of cottonseed prior to planting, and the effect of seed treatment on the abundance of lateral roots produced by cotton seedlings was studied. Counts were made of the number of lateral roots produced along the first inch of the tap root of 10-day-old seedlings grown throughout the year under greenhouse conditions. Seedlings from untreated fuzzy Watson seed produced an average of 15, 17, 15 and 15 lateral roots per inch during the spring, summer, fall and winter months, respectively. Seedlings from Watson seed soaked 24 hours in an aqueous solution of 250 parts per million indolebutyric acid prior to planting produced 21, 24, 15 and 7 per cent. more lateral roots than those from untreated seed during the spring, summer, fall and winter, respectively. Corresponding percentages for seed soaked in 500 parts per million indolebutyric acid solution were 42, 53, 23 and 5.

119. Effect of Chloropicrin on the Germination Capacity of Cotton Seeds. By Z. V. Ivanova-Aleksandrovskaya. (*Proc. Lenin Acad. Agr. Sci. U.S.S.R.*, **6**, 11, 1941. Moscow. In Russian. From *Rev. App. Ent.*, xxx., Ser. A, **12**, 1942, p. 581.) In the experiments described, seeds of Egyptian and American cotton having moisture contents of 8·7 and 9·1 per cent., respectively, were fumigated with chloropicrin at rates equivalent to 2, 6 and 7

fl. oz. per 100 cu. ft., and in an atmosphere saturated with the fumigant. The temperature varied from 15° to 18° C. (59-64·4° F.), and the exposure lasted 24 hours. The germinating power of the seeds was affected only by the saturated atmosphere, whereas fumigation at rates of 1·8-2 fl. oz. per 100 cu. ft. is completely effective against the pink bollworm (*Platyedra gossypiella*) and 2-3 fl. oz. against other cotton pests. Seeds punctured in three places lost all their germinating power after fumigation. The resistance to fumigation of the seeds of Egyptian cotton decreased as their moisture content rose from 7·25 to 14·9 per cent., but fumigation at temperatures of 12-41° C. (53·6-105·8° F.) had no effect on germination.

120. Cotton Plant Dusting Machine. Niagara Sprayer and Chem. Co. Inc., New York. (U.S.P. 2,274,359. From *Summ. Curr. Lit.*, xxiii., **1**, 1943, p. 3.) A machine for distributing insecticidal powder has a hopper that converges to a slotted, rounded part which engages with a regulator plate having a graduated, adjustable orifice, so that the supply of powder can be controlled.

121. Cotton Harvesting Machine. By J. D. Rust. (Tenn. U.S.P. 2,268,623. From *Summ. Curr. Lit.*, xxii., **24**, 1942, p. 581.) The cotton harvesting machine has an endless conveyor of slats carrying spindles, a plant tunnel, spindle guards below the spindles, and a trough extending from the rear to the front and discharging into the plant tunnel, this trough being located beneath the spindle guards along the side of the machine opposite the tunnelled side.

122. Cotton Harvesting Machine. International Harvester Co. (Chicago. U.S.P. 2,259,894. From *Summ. Curr. Lit.*, xxii., **21**, 1942, p. 492.) An over-running clutch is interposed in the power-drive connection for the belt carrying the picking spindles on a harvesting machine, so that if the forward travel of the machine is greater with respect to the plants engaged by the belt than the peripheral speed of the belt as driven by the power-drive connection, the belt may be over-driven by engagement with the plants.

123. Cotton Harvesting Machine. By W. N. Smith. (Dallas, Texas. U.S.P. 2,261,572. From *Summ. Curr. Lit.*, xxii., **21**, 1942, p. 492.) The machine has a pair of opposed picking assemblies, each comprising a casing, a number of rows of barbed spindles arranged in sleeves for successive reciprocating movement, an actuating bar for each row of spindles operated along a track by eccentrics on a pair of shafts journalled in the casing, and means for stripping cotton from the barbed spindles and passing it through a pre-cleaning assembly to a receiver.

124. Cotton Cleaning Machine. By J. F. Graham. (West Memphis, Ark. U.S.P. 2,258,928. From *Summ. Curr. Lit.*, xxii., **20**, 1942, p. 467.) Apparatus for cleaning cotton after it has left the gin comprises a lower flue provided with lengthwise corrugations, an upper flue with transverse corrugations, an elbow joining the flues, means for admitting cotton from the gin into the lower flue so that it travels across the corrugations and deposits its foreign matter on them, this falling through holes on to a conveyor, and means in the elbow to change the flow of air and cotton into longitudinal movement across the corrugations in the upper flue, where the cleaning is continued by similar means.

125. Cotton Cleaning Machine Screen. By J. T. Lawrence. (Inman, S. Carolina. U.S.P. 2,262,984. From *Summ. Curr. Lit.*, xxii., **21**, 1942, p. 494.) The cotton is drawn by suction (applied at the outlet) past a beater and screen through which fine particles fall out, and is then conveyed by a lattice to a doffer leading to the outlet. The screen is formed of wire fabric supported on transverse and longitudinal slats arranged so as to provide an undulating or corrugated screen surface.

126. Cotton Cleaning and Drying Machine. By E. B. Hinckley, Jnr. (U.S.P. 2,276,397. From *Summ. Curr. Lit.*, xxiii., **2**, 1943, p. 28.) The machine has, on the same horizontal plane, a series of paddle drums rotating over dirt cages. Above each drum is a curved baffle plate from which the cotton rebounds to a cleaning screen over the next drum, falls on to this drum and is carried forward again. The cotton enters above the first drum, and means are provided for collecting the clean cotton and the trash. The space above the drums constitutes a series of chambers in which hot air is forced through nozzles into the streams of cotton discharged from the various drums.

127. Cotton Drying Tower. By R. M. Joyce. (Miss. U.S.P. 2,266.640. From *Summ. Curr. Lit.*, xxii., **23**, 1942, p. 551.) Moist cotton and drying air enter at the top of an airtight tower, the space in which is filled out by a number of floors that provide a zigzag path for the cotton from the top to the outlet at the bottom. The space between the wall, the fixed end of one floor and the free end of the floor above, is occupied by a spiked roller to retard the cotton.

128. Effects of Artificially Drying Seed Cotton on Certain Quality Elements of Cottonseed in Storage. By R. A. Rusca and F. L. Gerdes. (*U.S. Dpt. Agr. Circ.*, 651, 1942. From *Exp. Sta. Rec.*, **88**, 1, 1943, p. 43.) A 2-year study of wet and dry cottonseed of the 1939 and 1940 crops, handled to simulate oil-mill and cotton-gin storage conditions, revealed that the process of artificially drying seed cotton at the gins has a beneficial effect on the storage qualities of the seed. Seed moisture content and temperature were decreased by the drying process, and development of free fatty acids was definitely retarded. Viability was increased slightly. A free fatty acid content of 2 per cent. was shown to be critical in so far as germination is concerned.

129. Cotton Gin Maintenance. By C. A. Bennett and F. L. Gerdes. (*U.S. Dpt. Agr. Leaflet*, 216, 1942. From *Exp. Sta. Rec.*, **87**, 4, 1942, p. 581.) Provides a general guide for " repairing and modernizing ginning machinery. The topics specifically dealt with are: checking pneumatic cotton-handling equipment: inspecting drying, cleaning, and feeding equipment; putting gin stands in shape; modernizing gin breasts; necessary attention to gin saws; testing lint-doffing systems; ginning bearings, belts, and pulleys; providing pure seed-handling equipment; inspecting lint-handling systems; checking kicker, tramper, and press: maintaining gin building; and care of the gin during the idle season."

130. A Practical Seed-Cotton Moisture Tester for Use at Gins. By G. E. Gaus *et al.* (*U.S. Dpt. Agr. Circ.* 621, 1941. From *Exp. Sta. Rec.*, **86**, 5, 1942, p. 690.) The tester is designed to register the hygrometric condition of the air confined within a mass of seed cotton by means of wet-bulb and dry-bulb thermometers, over which the air to be tested is drawn by suction provided by a vacuum cleaner. Drawings and a bill of material for the construction of the tester from standard pipe fittings and inexpensive accessories are included. A conversion table gives equivalent moisture content corresponding to the range of relative humidities indicated by the tester when used with seed cotton. A coefficient of correlation with drying-oven moisture determinations of 0·94 and a standard error of estimate of 1·48 per cent. were found. A moisture-content calculator employing a set of adjustable wet-bulb and dry-bulb temperature integrating scales for direct reading of corresponding moisture content from temperature readings made with the moisture tester is also described. A bill of material and specification for the construction and assembly of the calculator are included, and it is shown in photographs but not in working drawings.

131. Cotton Ginning for Pure Seed Preservation. By C. A. Bennett and F. L. Gerdes. (*U.S. Dpt. Agr. Leaflet*, 217, 1942. From *Exp. Sta. Rec.*, **87**,

6, 1942, p. 863.) This leaflet points out the means by which the mixing of seed of different varieties of cotton can be prevented during the ginning processes, and also the precautions which must be taken at any gin to make it suitable for the preservation of seed purity. Methods considered practical consist in the use of (1) self-cleaning belts, (2) self-cleaning blowpipe systems, (3) gravity chutes in two-storey gins, and (4) combinations of (1) and (2). Systems now in use for putting these methods into practice comprise: (1) A horizontal flat seed belt in a smooth trough below the stands, delivering either to an inclined belt or to a seed-blowing pipe through a vacuum wheel seed-feeder. (2) A reversible horizontal flat seed belt beneath the stands, operating in one direction to deliver gin-run seed and in the other to deliver pure seed, each discharging into disposal apparatus by various means. (3) Two individual conveyors beneath the stands, gin-run seed being handled in the front system and pure seed in the rear one, or vice versa, each screw system having its own lifts and deliveries. The pure-seed system, of course, is completely accessible for cleaning between runs. (4) In two-storey gins gravity chutes with hinged covers in front of or below each gin stand, diverting pure seed by gravity into funnels, sacks, or belts below. A standard screw conveyor is generally used on gin-run seed. (5) Gravity chutes similar to those described above, short enough for single or two-storey gins, delivering pure seed from each gin stand into a blowpipe by means of individual rotating vacuum-wheel seed-feeders. It is pointed out that when elevation of cottonseed is necessary, only the blowpipe or inclined-belt systems can be regarded as self-cleaning. Vertical screw and bucket-type elevators cannot be depended upon to be fully self-cleaning even when seed from several bales has been run through the system in an effort to clean it before commencing to save planting seed.

132. Compression of Cotton at Cotton Gins. By C. A. Bennett. (*Agr. Eng.*, **22**, 8, 1941, p. 281. From *Exp. Sta. Rec.*, **87**, 3, 1942, p. 432.) The author briefly describes present practices with gin bales, gin buildings and press types, and engineering features and performance of gin presses. He adds some account of an experimental cotton-gin press used by the U.S. Dpt. Agr. Bureau of Agricultural Chemistry and Engineering and the Agricultural Marketing Service in producing standard density bales of 24 lb. per cubic foot. The major elements of the all-steel construction are shown in drawings. A maximum load of 500 tons is planned for three rams, of which the travel is slightly more than 8 feet. One side of the press is fitted with a box 20 inches wide by 54 inches long by 111·5 inches deep, the other side is the conventional $27 \times 54 \times 111{\cdot}5$ inches in size. Bales of equal density pressed in the narrow box required about half as much pressure as those from the wide one, a reduction of 25 per cent. in width thus causing a reduction of 50 per cent. in the required hydraulic pressure on the rams. A study of pumping and piping arrangements is also mentioned, together with a device invented at the Cotton Ginning Laboratory to retain low-power requirements as pressures rise by cutting pump cylinders out of load service on proportionate steps of pressure.

133. Cotton Gin Roller Box Front. Lummus Cotton Gin Co. (U.S.P. 2,269,934. From *Summ. Curr. Lit.*, xxii., **24**, 1942, p. 581.) The curved front wall of a gin roller box is carried by a shaft between end plates mounted on the gin heads, and is manipulated by a lever secured to the shaft and pivoted to the gin head at one side of the machine.

134. Cotton Press Control Mechanism. By J. J. Wallace. (Amite, Louisiana. U.S.P. 2,267,358. From *Summ. Curr. Lit.*, xxii., **23**, 1942, p. 551.) In a cotton press of the type in which a pair of press boxes rotate alternately between a tramper and a ram, means are provided for simultaneously lifting

the boxes from their sills to permit them to rotate, and also for breaking the driving connection between a source of power and the tramper.

135. Cotton Baling Machine. By W. D. Cohea and H. S. Eubanks. (U.S.P. 2,284,044. From *Summ. Curr. Lit.*, xxiii., **5**, 1943, p. 112.) The press box can be divided into compartments and the oncoming stream of cotton fed at will to any compartment so that selected portions of the cotton occupy predetermined positions in the bale.

PESTS, DISEASES, AND INJURIES, AND THEIR CONTROL.

136. Insecticides and Fungicides. By A. L. Efimov and I. A. Kazas. (In Russian. Moscow, Sel'khozgiz, 1940. Price 4 rub. From *Rev. App. Ent.*, xxx., Ser. A, **9**, 1942, p. 419.) Over 60 chemicals are now produced in the Russian Union for the protection of plants and plant products from injurious insects and fungi, and the properties and uses of the more important of them are reviewed in this book, which is intended for use in agricultural colleges. The first section contains general information on the classification and toxicity of poisons, methods of application and the physical and chemical properties that dusts, sprays and fumigants should possess to be effective against Arthropods and fungi. The second section deals with stomach and contact insecticides; it contains a chapter on arsenicals by P. V. Popov and others on compounds of fluorine and barium, sulphur and its compounds, soaps, oils, and insecticides of vegetable origin. Fumigants for the treatment of plants and stored products are dealt with in the third section, and fungicides in the fourth. The subjects discussed under each substance include its production, properties, methods of use, and action on insects or fungi, plants and man and domestic animals. Precautions to be adopted during the transport, storage and handling of poisons are summarized in a final section. The book has no index.

137. Cotton Insect Pests: Control. By R. C. Roark. (*Chem. and Eng. News*, **20**, 1942, p. 1169. From *Summ. Curr. Lit.*, xxii., **21**, 1942, p. 489.) Lists are given of the principal insects attacking cotton plants in the United States and of the principal insecticides and fungicides used to combat them. These include arsenicals, fluorine compounds, contact poisons such as nicotine, rotenone, and sulphur, and organic-mercury seed disinfectants. The composition, uses, methods of application, and estimated annual consumptions are discussed.

138. Cotton Insect Problem met by Research Information as Basis of Poison Programme. By C. Lyle. (*Miss. Farm Res.*, **5**, 6, 1942. From *Exp. Sta. Rec.*, **87**, 5, 1942, p. 695.) A practical account.

139. Protecting Cotton from Insects and Plant Diseases. By F. A. Fenton and K. S. Chester. (*Circ.* 96, Oklahoma Agr. Exp. Sta., 1942.) *Cotton pests.* Directions are given in popular terms for the control under Oklahoma conditions of boll weevil (*Anthonomus grandis*) by dusting with full-strength calcium arsenate (undiluted with hydrated lime) at the rate of 4 lb. per acre on young cotton and 5-7 lb. on older plants; of cotton aphis (*Aphis gossypii*) by dusting with 3 per cent. nicotine dust at the rate of 8-14 lb. per acre; of cotton flea-hopper (*Psallus seriatus*) by dusting with superfine dusting sulphur, by prevention of overgrazing, and destruction of croton weeds; of leafworm (*Alabama argillacea*) by dusting with undiluted calcium arsenate; of cotton bollworm (*Heliothis armigera*) by dusting with calcium arsenate at the rate of 10 lb. per acre.

Cotton Diseases.—Directions are also given for the control of cotton root rot (*Phymatotrichum omnivorum*) by crop rotation; of wilt (*Fusarium vasinfectum*) by the cultivation of such resistant varieties of cotton as Stoneville 2-B and Roldo Rowden and by the use of potash-containing fertilizer; of bacterial blight

(*Phytomonas* [*Bacterium*] *malvacearum*)—the most prevalent cotton disease in the State—by treatment of the cottonseed with "New Improved Ceresan" or "2 per cent. Ceresan" (1½ and 3 oz. per bushel, respectively, costing 4 to 6 cents per bushel) or delinting with sulphuric acid (½ gal. per bushel), combined with crop rotation. Seed treatment is also recommended for the control of boll rots.

140. The Determination of Rotenone in Derris Root. By H. E. Coomber *et al.* (*J. Soc. Chem. Ind.*, July, 1942, p. 110. From *Bull. Imp. Inst.*, xl., **3**, 1942, p. 179.) Describes an improved method for estimating rotenone in derris root, employing the carbon tetrachloride complex separation. It has been shown by three groups of workers to give concordant results with various types of root. Methods of determining moisture content and chloroform extract are also given.

141. A Convenient Cage for Confining Insects to Plants. By J. T. Medler. (*J. Econ. Ent.*, **35**, 2, 1942, p. 283. From *Rev. App. Ent.*, xxxi., Ser. A, **1**, 1943, p. 19.) The author describes the construction of a small cage from a short celluloid tube, covered at one end with bolting silk or gauze, in which individual insects can be confined on plant parts without apparent interference with the normal activity of the insect and without injury to the plants. The cage can be fastened against such plant parts as cotton bolls with adhesive tape, or over leaves or stems by cutting one slit from the open end to take the petiole or two for the stem, and adjusting a cork in the end so that no space is left for the escape of the insect. The cage is light enough to be used on stems without support, but on petioles or leaflets it should be suspended by means of a bent pin in the cork.

142. Memoria de los Trabajos Realizados por la Estación de Fitopatologia Agricola de la Coruña, 1939-40. (*Publ. Estac. Fitopat. Agric.*, Coruña, 1941. From *Rev. App. Mycol.*, xxi., **9**, 1942, p. 403.) An account is given by J. R. Sardiña and P. Urquijo Landaluze of a species of *Empusa* parasitic on the aphids *Aphis gossypii*, *A. laburni* and *Capitophorus* (?) *whitei* on saltwort, bean, and chilli plots at the Experiment Station. Its branched, claviform conidiophores, 96·9 to 110·5 by 8·5 to 11·1 μ, bore subspherical primary conidia, with a truncate base and mucronate apex, 9·3 to 11·9 by 10·2 to 14·5 μ, and hyaline spores, shaped like grape pips, 21 to 30 by 10 to 11·5 μ. Affected aphids assume a chestnut to olive tinge. Inoculation experiments in the laboratory gave inconclusive results.

143. Insect Investigations by the Arkansas Station. By D. Isely *et al.* (*Ark. Sta. Bull.* 417, 1942. From *Exp. Sta. Rec.*, **88**, 1, 1943, p. 72.) A progress report of work in connection with boll weevil, cotton aphid, cotton leafworm, bollworm, common red spider, and cotton flea hopper.

144. Nyasaland: Report of the Entomologist, 1941. By C. Smee. (Zomba. Nyasaland, 1942. From *Rev. App. Ent.*, xxx., Ser. A, **10**, 1942, p. 502.) Pink bollworm was present on cotton in the Lower River districts in only small numbers, this being due possibly to a well-conducted "close season" campaign, which was also beneficial in one area against *Diparopsis castanea* (Red bollworm). Parasites on cotton included *Euplectrus laphygmæ* Ferrière, reared from *Laphygma exigua* Hb. and *L. exempta* Wlk., *Euplectromorpha obscurata* Ferrière, from *Tortrix* (*Cacœcia*) *occidentalis* Wlsm.

145. Cotton Insect Investigations in Peru. By F. F. Bibby. (*J. Econ. Ent.*, **35**, 2, 1942, p. 193. From *Rev. App. Ent.*, xxxi., Ser. A, **1**, 1943, p. 10.) An account of investigations carried out in Peru between September, 1938, and March, 1939, on the control of insect pests of cotton, chiefly *Aphis gossypii*. Infestation by the aphid was relatively unimportant in spring but serious in summer, apparently owing to the use of arsenicals, principally calcium arsenate dust, for the control of the Noctuids, *Alabama argillacea* and *Anomis texana*, and

an attempt was therefore made to find substitutes for the arsenicals. When dusts of cryolite and sulphur (20 : 80), Paris green and sulphur (25 : 75) and calcium arsenate were applied three times at weekly intervals after the spring aphid infestation, and before the Noctuids became injurious, aphid infestation was negligible in the control plots 2 and 3 weeks after the last application, little higher in those receiving cryolite, but severe in those receiving Paris green or calcium arsenate. In January, when both Noctuids and *Anthonomus vestitus* were present, the cryolite dust was rather less effective than calcium arsenate against the former, though it gave satisfactory control, and equal or superior to it against the weevil. In further tests, dusts containing 0·75 per cent. rotenone from cubé, with sulphur or an inert carrier, pyrethrum (0·1 per cent. pyrethrins) in sulphur (25 : 75), Paris green and sulphur (20 : 80), cryolite and sulphur or calcium arsenate were applied in January and February; Paris green gave complete control of the Noctuids, and the others, with the exception of pyrethrum, which was useless, were quite effective; rotenone gave rather better results with sulphur than with the inert dust. Aphid infestation became severe on the plots that received the arsenicals, but was negligible on the others. Although plants that were sprayed with calcium arsenate were less attacked by aphids than those that were dusted with it, dusting is considered to be preferable under conditions in Peru. Of three insecticides that were applied in February to plots heavily infested with the aphid, 1·2 per cent. rotenone in sulphur gave excellent control, and pyrethrum flowers (0·1 per cent. pyrethrins) and sulphur (25 : 75) was rather less effective, but much better than a mixture of nicotine sulphate and calcium arsenate containing 2 per cent. nicotine. It is, therefore, likely that the spring aphid infestation could be controlled with sulphur containing 1-1·5 per cent. rotenone. An outbreak of *Leucothrips piercei*, Morg. was effectively controlled in October by the application of dusting sulphur alone or with nicotine sulphate to provide 2 per cent. active nicotine.

146. Queensland: Cotton Pests in 1941-42. (*Rpt. Dpt. Agr. and Stock, Qnslnd.*, 1941-42.) The only seedling pest of any consequence was the tipworm which attacked early planted cotton in the Callide Valley. Weed growth in spring in the Callide Valley ensured a rapid increase in corn earworm population, and in December square damage in both irrigated and non-irrigated cotton was serious. With the advent of very dry conditions later the outbreak ceased. In autumn the cotton looper and the rough bollworm were numerous on the crop. Cotton jassid threatened to cause appreciable damage to cotton in February and March, but with improved growing conditions later squares were produced and matured in spite of the pest. The pink bollworm, though present in most districts, had little effect on cotton yields. This pest was recorded for the first time from Southern Queensland in cultivated cotton at Lowood. The pink bollworm project at Glenmore Ginnery was completed, and the final report showed that few, if any, of the larvæ survived the ginning process. This is probably due to the improved type of cleaning machinery installed a few years ago, which evidently eliminates most of the larvæ, such larvæ as are not eliminated in the cleaning process being apparently killed in the gins.

147. Russia: Results of Work of the Plant Protection Station of the Cotton Research Institute on Pests and Diseases of Cotton and Lucerne. (*Sojuznikhi*, Tashkent, 1941. From *Pl. Bre. Abs.*, xiii., **1**, 1943, p. 56.) Tests of resistance to the attacks of red spider have shown Egyptian cottons and *G. herbaceum* to be the most resistant. The hybrid $F_6$46, which is characterized by very hairy leaf surface, is particularly resistant and has been classed as practically immune. This hybrid will be used as a parent for further breeding. The Egyptian × Peruvian hybrid 40/5963 also proved very resistant.

148. United States: Report of the Chief of the Bureau of Entomology and Plant Quarantine, 1940-41. By P. D. Annand. (Washington, D.C., U.S. Dpt. Agr., 1942. From *Rev. App. Ent.*, xxx., Ser. A, **12**, 1942, p. 589.) Several insecticides were tested for the control of the bollworm, *Heliothis armigera*, on cotton, since calcium arsenate is slow in action and not very effective against the older larvæ. The percentage mortalities among laboratory-reared larvæ varied inversely with their size, but averaged 92 for a mixture of equal quantities of basic copper arsenate and lime, 88 for lead arsenate, 84 for undiluted basic copper arsenate, 83 for cryolite containing 66 per cent. sodium fluoaluminate, and 62 for calcium arsenate. In field tests in Texas, the yield of seed cotton from plants that had been treated with cryolite containing 50, 66, 87 and 95 per cent. sodium fluoaluminate at the rate of 16-20 lb. per acre was increased by 51, 124, 163 and 179 lb. per acre, respectively, the corresponding increases for plots dusted with calcium arsenate, basic copper arsenate and lead arsenate at the rate of 8-10 lb. per acre being 144, 155 and 208 lb. When calcium arsenate, lead arsenate and micronized barium fluosilicate were applied as dusts and sprays, the increase in yield in plots treated with dusts averaged about 33·3 per cent. more than in those treated with sprays. Field observations have shown that heavy oviposition by *H. armigera* is not invariably followed by severe larval infestation and that the larvæ are often most injurious in fields in which aphids are common. In addition to hot, dry weather, which prevents hatching, the eggs and young larvæ are destroyed by predators, including Coccinellids, Chrysopids, Syrphids and *Orius insidiosus* Say. In the laboratory, this Anthocorid consumed many eggs daily when other food was scarce, but very few when aphids were present. A dust containing calcium arsenate and enough nicotine to destroy the aphids had little effect on *O. insidiosus*, and its use might increase the effectiveness of this predator in the field.

Introduced parasites reared and released in considerable numbers against the pink bollworm (*Platyedra gossypiella*) in Texas comprised *Chelonus pectinophoræ* Cushm., which was imported from Japan during the year, *C. blackburni* Cam., *Microbracon nigrorufum* Cushm., and *M. kirkpatricki* Wlkn. In the Lower Rio Grande Valley, pink bollworm continued to breed from May, 1940, until severe weather in January, 1941, destroyed the squares and bolls. The maximum durations of the larval diapause were from September 25 until June 11 in open bolls on standing stalks, from September 26 to April 21 in open bolls on the soil surface, from October 28 until May 20 in bolls collected green and left on the soil surface, and from October 28 until March 17 in bolls collected green and lightly covered with soil. The maximum survival rate occurred in bolls on standing stalks, so that it is desirable to cut the stalks or plough them under in autumn, even if the bolls cannot be destroyed. No larvæ were found to overwinter in free cocoons in the soil in this area.

149. Texas: Cotton Pests in 1941. (*54th Ann. Rpt. Texas Agr. Exp. Sta.*, 1941, p. 30.) The severe injury caused by boll weevil was due to favourable weather conditions for its multiplication and to the shortage of calcium arsenate and dusting machinery. Cotton flea hopper (*Psallus seriatus*) infestation was less during the season, but cotton bollworm (*Heliothis armigera*) caused considerable injury. Most of the failure to obtain control of this pest was due to the inability of farmers to get into the fields with dusting equipment at the proper time, and to faulty application. Thrips damage was present in most fields of North Texas, and in 25 fields averaged 30 per cent. In the Presidio Valley the flood of 1938 and the initiation of the Bureau of Entomology's control programme against pink bollworm has greatly reduced infestation by this pest during the past three years. Introduced parasites were reared and released in the Presidio Valley as follows: *Chelonus blackburni*, 85,000; *C. pectinophoræ*,

55,000; *Microbracon kirkpatricki*, 18,185; and *M. mellitor*, 385. Colonization of *C. blackburni* and *M. mellitor* was terminated at the end of the season, these species having been given sufficient opportunity to become established.

150. BOLL WEEVIL CONTROL BY SPRAYING OR DUSTING. By K. P. Ewing. (*J. Econ. Ent.*, **34**, 1941, p. 498. From *J. Text. Inst.*, xxxiii., **2**, 1942, A63.) For a light infestation by the boll weevil spraying with Pb arsenate was more effective, in terms of cotton yield, than dusting with Ca arsenate, but when the infestation was heavy dusting with Ca arsenate gave the best results.

151. EFFECT OF BOLL WEEVIL CONTROL AND COTTON APHID CONTROL ON YIELD AS SHOWN IN A FACTORIAL EXPERIMENT. By R. C. Gaines. (*J. Econ. Ent.*, **34,** 4, 1941, p. 501. From *Exp. Sta. Rec.*, **86**, 1, 1942, p. 66.) Experimental applications of calcium arsenate and of both calcium arsenate and nicotine dust were followed by significant reductions in boll weevil infestation at Tallulah, La., and College Station and Waco, Texas, and significant increases in yield at Tallulah and College Station. Applications of nicotine dust and of both nicotine dust and calcium arsenate were followed by significant reductions in cotton aphid infestation at all localities except Florence, South Carolina, but they did not significantly affect boll weevil infestation or yield at any locality. Applications of both calcium arsenate and nicotine dust interacted to cause significant reductions in cotton aphid infestation at Tallulah, College Station, and Waco, and to cause a significant increase in yield at Tallulah. Applications of calcium arsenate were followed by significant increases in aphid infestation at all localities. The increased yield following applications of both calcium arsenate and nicotine dust over that following calcium arsenate alone was 95 lb. of seed cotton per acre at Florence, 205 lb. at Tallulah, and 80 lb. at College Station, but at Waco there was a loss of 20 lb.

152. BOLL WEEVIL AND COTTON APHID CONTROL BY THE USE OF DERRIS IN COMBINATION WITH CALCIUM ARSENATE. By C. F. Rainwater and F. F. Bondy. (*J. Econ. Ent.*, **34,** 6, 1941, p. 733. From *Rev. App. Ent.*, xxx., Ser. A, **9,** 1942, p. 427.) Tests on the effect on *Aphis gossypii* Glov. of adding derris to dusts of calcium arsenate or equal quantities of calcium arsenate and sulphur, applied to cotton for the control of boll weevil (*Anthonomus grandis* Boh.), were continued in Mississippi, South Carolina, Louisiana, and Texas in 1940. Enough derris was used to give the mixed dusts a rotenone content of 0·5 per cent. Eight effective applications at the rate of 12 and 6 lb. per acre of dusts with and without sulphur, respectively, were made in each locality at 5-day intervals, beginning when the first blooms appeared, but the data on boll weevil in South Carolina and on the aphid in Texas were not analysed, as the infestations were too light. Statistical analysis of the remaining results showed no significant differences between any two treatments in the control of boll weevil, but a highly significant difference between each treatment and the untreated plots. Aphid populations were significantly lower after treatment with the dusts containing derris than after those without it, and in some localities yields were significantly higher after treatment with calcium arsenate and derris than after calcium arsenate alone; in some instances the addition of sulphur to the dusts caused significant reductions in the numbers of aphids. These results were confirmed by the experience of a group of farmers in North Carolina who used a mixture of equal parts of calcium arsenate and sulphur containing enough cubé to give a rotenone content of 0·5 per cent., and it is concluded that injurious numbers of aphids will not occur as a result of dusting cotton with calcium arsenate for the control of boll weevil if the dust contains this amount of rotenone.

153. THE IMPORTANCE, DISTRIBUTION, FOOD-PLANTS AND NATURAL ENEMIES OF *Chalcodermus bondari* MARSHALL. By H. G. F. Sauer. (*Rev. Ent.*, **12,** 1-2.

Rio de Janeiro, 1941, p. 42. In Portuguese. From *Rev. App. Ent.*, xxx., Ser. A, **9**, 1942, p. 424.) The distribution, food-plants and natural enemies of *Chalcodermus bondari* Mshl., which does a certain amount of damage in north-eastern Brazil and in parts of the Chaco region in Argentina, are reviewed from the literature. In São Paulo the larvæ are parasitized by a Braconid of the genus *Heterospilus* and a Pteromalid near to *Zatropis incertus* Ashm.

[*Cf.* Abstr. **205**, Vol. XVII. of this Review.]

154. NOTES ON THE BIOLOGY OF *Conotrachelus denieri* HUST., A PEST OF COTTON. By P. C. L. Denier. (*Rev. Soc. Ent. Argentina*, xi., **3**, Buenos Aires, 1942, p. 185. In Spanish. From *Rev. App. Ent.*, xxx., Ser A, **9**, 1942, p. 423.) These notes are based on observations made in the Territory of Formosa, north-eastern Argentina, and in a neighbouring district in Paraguay, where *Conotrachelus denieri* Hust. is a serious pest of cotton. The eggs are laid in cavities in the tender parts of plants of all ages and in the fruits. The larvæ mine the shoots and, as soon as they become available, the bolls. Very young seedlings are almost always killed by the attack, while older plants are delayed in development but sometimes recover. Infested bolls do not open. Pupation normally occurs in the soil at a depth of about an inch. The adult weevils feed on the stems, shoots and petioles and the parts of the roots close to the collar, causing the death of very young plants. The author has not observed the weevil on any plant other than cotton, though it has been stated in Paraguay to infest wild Malvaceæ occasionally, and larvæ found by him on other Malvaceæ have proved to be those of *C. rubicundulus* Boh. (which also infests cotton), or a still further species. Possible methods of control are discussed. The weevil is spreading, and where it has appeared for the first time and in small fields, the most practical measure is the immediate and complete destruction of the crop and the cessation of cotton growing. The campaign of eradication in Argentina is progressing satisfactorily, and cotton is not being grown for the present in the frontier districts.

155. ARIZONA: INVESTIGATIONS IN ECONOMIC ZOOLOGY AND ENTOMOLOGY. (*Ariz. Sta. Rpt.*, 1941. From *Exp. Sta. Rec.*, **87**, 6, 1942, p. 819.) Includes a progress report of work on the biology and control of the cotton pest *Creontiades femoralis* Van D.

156. *Gasterocercodes* PIERCE, SINONIMO DE *Eutinobothrus* FAUST. By A. da Costa Lima. (*Chacaras e Quint.*, **58**, São Paulo, 1938, p. 471. From *Rev. App. Ent.*, xxx., Ser. A, **12**, 1942, p. 585.) A weevil boring in *Sida* sp. in Minas Geraes, Brazil, has been identified as a species of *Eutinobothrus*, probably *puncticollis* Hust. As a result of the examination of specimens, the author considers that *Gasterocercodes*, Pierce, of which the species are *gossypii* Pierce and *brasiliensis*, Hambleton, is congeneric with *Eutinobothrus*.

157. ARGENTINA: DEPT. OF ENTOMOLOGY, TUCUMAN. By K. J. Hayward. (*Rev. Indus. Agr. Tucuman*, 1942. From *Rev. App. Ent.*, Ser. A, **2**, 1943, p. 41.) Pests of cotton included *Heliothis armigera*, *Dysdercus* sp., and the Malachiid, *Astylus atromaculatus* Blanch., which injured recently sown cotton seeds.

158. LOCUSTS. By F. D. Golding. (*Farm and Forest*, **2**, 8, Ibadan, Nigeria, 1941. From *Rev. App. Ent.*, xxx., Ser. A, **12**, 1942, p. 562.) This paper consists mainly of a popular account of the bionomics and outbreaks of locusts in Nigeria, supplemented by data, based on a series of surveys, on their migrations in the outbreak areas as a whole. The outbreak of *Locusta migratoria* which was intensive in 1938, terminated suddenly in 1939, possibly because of the exceptionally late onset of dry (harmattan) winds. No swarms of *Schistocerca gregaria* have been recorded in Nigeria since 1931, but in July, 1940, the beginning of a new swarming period was suggested by the appearance of swarms in Southern Algeria, 350-600 miles from the Nigerian border.

159. Anti-Locust Campaign. (*Crown Colonist,* April, 1943, p. 278.) An Anti-Locust Research Centre has been set up in London, financed by H.M. Government, various Colonial Governments, and the Government of the Anglo-Egyptian Sudan. The estimated cost in 1943-4 is £1,756. To meet present emergency conditions a mobile anti-locust organization, under the technical direction of the Research Centre, has been attached to the Middle East Supply Centre in Cairo. There are also in the Middle East and East Africa five reporting centres. Some £30,000 a year is being spent for the destruction of locusts in Persia, Arabia, Ethiopia, and the Middle East. This is additional to sums expended by the local Governments.

160. Note on the Poison-Bait used in Egypt for Controlling Locusts and Grasshoppers. By M. Hussein. (*Bull. Soc. Fouad* 1*er Ent.*, **25,** Cairo, 1941, p. 211. From *Rev. App. Ent.*, xxx., Ser. A, **9,** 1942, p. 422.) The poison baits used against locusts and grasshoppers in Egypt are made by moistening wheat bran with a prepared solution of 2·5 lb. sodium arsenite, 4·5 litres (about 1 gal.) molasses and 2·5 litres water, the mixture being diluted with water at the rate of 1 : 15. When stored in drums, the concentrated solution tends to deteriorate, and half of the soluble arsenious oxide was found to have been converted into insoluble arsenious or arsenic oxide after storage in a 4-gallon tin for three years. Laboratory and field experiments with hoppers of *Schistocerca gregaria* Forsk. in the first two instars have shown that the dosage of sodium arsenite in baits can be reduced to 0·5 lb. per 100 lb. of bran, but that the quantity of water should be not less than 15 gals. A bait made with 1 lb. sodium arsenite to 100 lb. bran gave equally good results with and without the addition of molasses. Baits containing 2 lb. sodium fluosilicate per 100 lb. bran for hoppers of the first two instars, and 4 lb. for older hoppers and adults, proved to be a satisfactory substitute for standard baits.

161. Fighting the Pink Invader (Pink Bollworm). By W. L. Wickline. (*U.S. Dpt. Agr., Off. For. Agr. Relat., Agr. in Americas,* **2,** 1, 1942, p. 3. From *Exp. Sta. Rec.*, **87,** 2, 1942, p. 254.) An account of work in the Rio Grande Valley.

162. The Taxonomic Status of the So-Called "Common Red Spider." By E. A. McGregor. (*Proc. Ent. Soc. Wash.*, **44,** 2. Washington, D.C., 1942. From *Rev. App. Ent.*, xxx., Ser. A, **12,** 1942, p. 600.) The author describes the characters distinguishing the males of the mite commonly known as *Tetranychus telarius* L. (for which he considers *T. althææ* v. Hanst., to be the correct name) and the lime-tree mite, *T. tiliarius,* Herm. (which is the species that he considers to be *T. telarius*) from each other and from *T. bimaculatus,* Harvey. In the course of the routine work of identifying spinning mites, he has accumulated data on the species occurring throughout the United States. *T. tiliarius* has never been identified from America, but both *T. telarius* (*althææ*) and *T. bimaculatus* have frequently been received from many localities in the United States and from Canada, and *T. telarius* also from Hawaii.

163. On the Biology of Red Spider Mite (*Tetranychus telarius* Linn.) in Baluchistan. By N. A. Janjua. (*Proc. Ind. Acad. Sci.*, Sec. B, **15,** 5. Bangalore, 1942, p. 256. From *Rev. App. Ent.*, xxx., Ser. A, **11,** 1942, p. 509.) *Tetranychus telarius* has recently been observed in the hilly tracts of Baluchistan, from which it has not previously been recorded. All stages of this mite, its process of development and its manner of feeding are described. The time taken for the development of a generation was 22-28 days in winter and 9-12 days in summer, and in the Quetta Valley there are about 21 generations a year. Many fruit trees, vegetables and ornamental plants are attacked. The Coccinellid, *Adalia decempunctata* L., and a species of *Chrysopa* are predaceous on the mites at Quetta, but are not sufficiently numerous to afford much control.

164. *Reticulitermes tibialis* IN COTTONSEED HULLS. By C. H. Kinsley. (*J. Econ. Ent.*, **35**, 1, 1942, p. 76. From *Rev. App. Ent.*, xxx., Ser. A, **11**, 1942, p. 527.) Cottonseed hulls have often been used of recent years in grasshopper baits in California, and in 1941 over 200 sacks containing them were stacked for the summer in the open, only 171 feet above sea-level, on bare ground that was slightly damp at the time of stacking. At the end of the summer the bottom layer was found to be infested by *Reticulitermes tibialis* Banks, which is widely distributed in the Western United States and occurs frequently at high elevations. Termites had not previously been observed in this locality in cottonseed hulls.

165. HOST-SELECTION BY *Spathius critolaus* NIXON, AN IMPORTANT PARASITE OF *Pempherulus affinis* IN SOUTH INDIA. By P. N. Krishna Ayyar. (*Ind. J. Ent.*, **3**, 2. New Delhi, 1941, p. 197. From *Rev. App. Ent.*, xxx., Ser. A, **12**, 1942, p. 582.) *Spathius critolaus* Nixon is the most important parasite of *Pempherulus affinis* Faust. on cotton in South India, and since it is the only parasite that attacks the first generation and can be bred rapidly on its other hosts, it might be used for the control of this weevil. Lists are given of other natural hosts, including the Buprestid, *Sphenoptera araxidis*, on *Sesbania*, and of other food-plants on which *P. affinis* is attacked. Tests on the nature of the response of the parasite to the sensory impressions produced by such stimuli as the shape, texture, odour, size and movement of the host showed that all these factors operate in combination to render the host suitable for attack and that no single factor can account for the resulting behaviour of the parasite, though size and movement have considerable effect on choice. A series of experiments carried out to determine the factors governing the incidence of superparasitism and the general interactions of host and parasite populations indicated that the parasites normally prefer host larvæ in advanced instars and under a covering: pupæ were never attacked and larvæ in the early instars and prepupæ rarely. The female was able to discriminate between unparasitized and parasitized hosts, attacking relatively few of the latter, even when the parasite eggs had been removed from them. When only parasitized hosts were available, considerable restraint in oviposition occurred; when unparasitized hosts were included, host larvæ containing eggs were occasionally accepted and those with first-instar larvæ usually rejected. Superparasitism was not unusual and was influenced by the number and nature of the hosts available, irregularity in the availability of hosts, and the food-plant of the host. Parasitism of hosts on unnatural food-plants occurred in the laboratory, except on a few poisonous ones, unless hosts on natural food-plants were also present, when superparasitism occurred in these. There was no unusual accumulation of eggs in the ovaries of females unable to oviposit. When superparasitism occurred, it was unusual for all the parasites to develop, mortality being due chiefly to competition for food. Hosts parasitized by *S. critolaus* were not attacked by other parasites of *P. affinis*.

166. ECOLOGICAL STUDIES ON THE SPOTTED BOLLWORMS OF COTTON AND THEIR PARASITES. II. THE FECUNDITY AND LONGEVITY OF *Earias fabia* AND ITS PARASITE, *Microbracon greeni lefroyi*, UNDER DIFFERENT CONDITIONS. OF TEMPERATURE AND HUMIDITY. By T. Ahmad and G. Ullah. (*Ind. J. Ent.*, **3**, 2. New Delhi, 1941, p. 245. From *Rev. App. Ent.*, xxx., Ser. A, **12**, 1942, p. 583.) In this paper, which is part of a series, the results are given in detail of laboratory investigations on the fecundity, reproductive potential and longevity of *Earias fabia*, Stoll, and its parasite *Microbracon lefroyi*, D. and G., which the authors consider a race of *M. greeni*, Ashm., together with a brief discussion of the incidence of the two species and *E. insulana*, Boisd., which is also a host of the parasite, on cotton at New Delhi in relation to weather conditions. The following is taken from the authors' summary. It was not possible to control humidity

during adult life, but rearing the pre-imaginal stages of both host and parasite at different saturation deficiencies affected the reproductive capacity of the adults. At the optimum range of temperature, 25-30° C. (77-86° F.), the fecundity of the host is distinctly lowered if it is bred from material under saturated conditions, and that of the parasite is reduced when it is reared from material under rather dry conditions (14 mm. saturation deficiency); the reproductive potential of the parasite is usually greatest when it is bred from material kept at a saturation deficiency of 0-3 mm., indicating that moist conditions are generally more favourable to it than to its host. In order to test the validity of the laboratory conclusions in the field, the incidence of *Earias* spp. and *M. lefroyi* was determined by weekly examination of cotton buds and bolls at New Delhi, during 1939 and 1940, and the data collected were plotted on graphs and correlated with temperature and rainfall. In both years parasitism began to increase with the first shower of rain, and as the rains were well distributed throughout the summer and the temperatures remained moderate, the parasite continued to be active, with the result that the bollworms did not become very injurious. These field observations support the laboratory conclusions that rains in summer help to control the bollworm both indirectly by lowering the temperature to the benefit of the parasite, and directly by increasing the humidity.

[*Cf.* Abstr. **165**, Vol. XVIII. of this Review.]

167. Étude sur la Biologie de *Dysdercus superstitiosus* F. By J. M. Vrydagh. (*Série Sci.*, No. 24. I.N.E.A.C., 1941. Price, 15 Fr.) Four species of *Dysdercus* (cotton stainer) are found in the cotton fields of the Belgian Congo. These are, in order of importance, *D. superstitiosus* Fabr., *D. nigrofasciatus* St., *D. melanoderes* Karsch., *D. hæmorrhoidalis* Sign. Of these the first named is by far the most abundant, and multiplies with such rapidity that the bolls formed towards the end of the season are almost entirely destroyed, and an important part of the crop is lost each year from the effects of *Nematospora* infection mainly conveyed by this bug. The paper under notice reports on a detailed laboratory study of the life history of the species, including an investigation of the effects of temperature on the rate of development.

168. Natural History of Termites. By V. W. von Hagen. (*Sci. Mnthly.*, **55,** 1, 1942, p. 29. From *U.S. Dpt. Agr. Bibliog. Agr., Secn. Ent.*, **1,** 1, 1942, C-11.) Pt. II. Their social organization.

169. A Simple Method of Controlling Termites. By J. C. Cross. (*Sci.*, **95,** 2469. Lancaster, Pa., 1942, p. 433. From *Rev. App. Ent.*, xxx., Ser. A, **8,** 1942, p. 389.) The author states that he has obtained freedom from termites in his home in Texas by pouring about a quart of used crankcase oil into a small ditch round each of the concrete piers supporting the building, and a proportionate amount round the base of the chimney. Some concrete steps were overlooked, and this was the only point at which termites subsequently entered the building. After they were protected with the oil no further trouble was experienced, though the surrounding soil was heavily infested. The oil remained in the ground for a long time, did not diffuse more than a few inches from the ditches, and did not appear to affect the growth of shrubs 6 inches away.

170. Some Results of Termite Activity in Thailand Soils. (*Trop. Agr.*, xix., **9,** 1942, p. 184.) " In many parts of Thailand termites are of considerable benefit to farmers. The millions of mounds built by termites furnish small plots of modified soil which when utilized properly are useful for growth of trees and of ' upland ' crops in paddy districts, thus permitting a considerable degree of diversification in cropping and diet. The nature and distribution of termite mounds, and physical and chemical analyses of ten termite mounds from widely

different parts of Thailand and of their associated normal soils are reported in *Thai. Sci. Bull.*, **3**, No. 2. The most striking chemical feature of the mound soils was the accumulation of calcium carbonate in the base of the mounds, although the normal soils of the places where the mounds were sampled were moderately to strongly acid. Near the place where calcium carbonate concretions ('gravels') were first recognized as having come from termite mounds no deposits of calcium carbonate were known within several miles. The soils of termite mounds usually had a higher air-dry moisture content, their pore space was usually higher, and some other physical properties showed higher values than did normal soils. The higher fertility and consequently the agricultural importance of the mounds are due to their higher plant-nutrient content and *p*H, the better moisture relationships, and to the fact that the upper portions of the mounds are above the water level on the padi land. Destruction of the mounds is seldom advisable. When mounds are broken down and the earth spread about the former site, the productivity of the land remains very irregular and the growth of tobacco may be prejudiced. In one district, however, other fertility relationships seem to prevail. Recommendations are made as to the method of complete clearing of termite mounds, should this be deemed advisable. No mechanism is suggested to account for the differential accumulation of calcium in the mounds or for the other chemical and physical soil differences revealed."

171. Recent Advances in Control of Fungous Diseases of Plants. By G. W. Padwick. (*Ind. Frmg.*, iii., **9**, 1924, p. 478.) The author discusses the value of plant hygiene, breeding for resistance to disease, soil conditions and plant disease, and the use of fungicides. A good deal is known about the effect of physical conditions in the soil in relationship to the development of disease. The temperature most favouring the development of a number of diseases is known; for example, the wilt diseases of plants caused by species of *Fusarium* are most severe at rather high temperatures. Wilt of cotton occurs with great severity when the temperature of the soil is about 28° C., and with a soil moisture of 60 per cent. of the water-holding capacity. The smut diseases of the common cereals occur at lower temperatures, about 10° for common bunt, 10° to 20° for oat smut, and so on. Often it has been found that this optimal temperature is the same as that for the vegetative growth of the fungus, independently of the optimal temperature for growth of the host. This rather rules out the popular idea that a plant grown at the ideal temperature is necessarily more resistant to disease. It also opens up a new field—namely, the sowing of seed at the time least favourable for disease to develop. An example can be found in the cotton crop in the Punjab, which suffers severe root-rot if sown in the month of May, but not if sown by the first week of April or towards the end of June. A common drawback in such a method is that the abnormal date of sowing has sometimes an adverse effect on yield. A similar effect can be brought about by growing the cotton crop intermixed with another crop such as moth (*Phaseolus aconitifolius*), which lowers the soil temperature. The results of this method of control of cotton root-rot have proved extraordinarily successful. There are, however, cases in which the optimum for the disease is far lower than the optimum for the growth of the fungi in pure culture. This is due to the fact that at lower temperatures certain fungi are much less susceptible than at higher temperatures to competition by other soil micro-organisms.

172. Las Enfermedades del Algodonero en la Republica Argentina. By M. di Fonzo. (*Bol. Junta nac. Algodon*, 80. Buenos Aires, 1941, p. 951. From *Rev. App. Mycol.*, xxi., **9**, 1942, p. 417.) A useful survey of the symptomatology, etiology, mode of propagation, economic importance, and relationship to environmental factors and control of cotton diseases in the Argentine, including

observations on angular leafspot (*Bacterium malvacearum*), anthracnose (*Glomerella gossypii*), soreshin (*Corticium vagum* or *Rhizoctonia solani*), wilt (*Fusarium vasinfectum*), boll rots associated with various organisms—*e.g.*, *Monilia sitophila*, *Rhizopus nigricans*, *Cephalothecium roseum*, and *Aspergillus niger*, rust (*Cerotelium desmium*), crown gall (*Bacterium tumefaciens*), sooty mould (*Capnodium* sp.), yellow mosaic, and ring spot. A separate section is devoted to the question of seed treatments.

173. ARIZONA: PLANT DISEASE STUDIES. (*Ariz. Sta. Rpt.*, 1941. From *Exp. Sta. Rec.*, **87**, 6, 1942, p. 805.) Brief studies are reported on *Alternaria* infection of cotton bolls; cotton stubs, seed, and wind as sources of blackarm—angular leafspot infection; southern *Sclerotium* wilt and root rot of cotton; cotton rust (*Puccinia schedonnardi*).

174. A NEW CULTURE MEDIUM FOR THE GROWTH OF *Chætomium globosum*. By W. G. Chace and G. S. Urlaub. (*Amer. Dyest. Rptr.*, xxxi., **14**, 1942, p. 331. From *Rev. App. Mycol.*, xxi., **12**, 1942, p. 534.) The following cellulose agar medium was found at the Lowell Textile Institute to be superior to Czapek's agar for the development of *Chætomium globosum*, large quantities of the spores of which are required for the testing of mildew-proofed fabrics: 1,000 ml. water (tap or distilled with a trace of ferric sulphate), 3 gm. sodium nitrate, 1 gm. potassium dihydrogen phosphate (buffering the substratum at *p*H 5·0), 25 gm. magnesium sulphate, 0·25 gm. potassium chloride, 15 gm. agar, and 10 gm. filter paper. The use of this medium reduces the time needed for sporulation to four or five days, permits the production of spore quantities many times exceeding those obtainable on Czapek's agar, and virtually eliminates the common air-borne contaminants.

175. *Rhizoctonia* INFECTION OF COTTON AND SYMPTOMS ACCOMPANYING THE DISEASE IN PLANTS BEYOND THE SEEDLING STAGE. By D. C. Neal. (*Phytopathology*, xxxii., **7**, 1942, p. 641. From *Rev. App. Mycol.*, xxi., **12**, 1942, p. 524.) An uncommon phase of the cotton damping-off due to *Rhizoctonia* (*Corticium*) *solani* was noted in the Louisiana Delta in 1940 and 1941. Many of the plants in the early flowering stage, 7 inches to 14 inches high, were almost devoid of lateral roots, semi-prostrate, and with few fruiting branches. The stems bore deep-seated cankers above and below the soil-line, and many showed characteristic constrictions almost severing the stems just beneath the surface. About 90 per cent. of the cultures from infected tissues yielded *C. solani*. In cold, wet spring weather, the disease, which is usually confined to early planted cotton seedlings, may persist sufficiently late to cause appreciable damage to older plants.

176. INHIBITION OF MICRO-ORGANISMS BY A TOXIC SUBSTANCE PRODUCED BY AN AEROBIC SPORE-FORMING BACILLUS. H. Katznelson. (*Canad. J. Res.*, Sect. C, xx., **3**, 1942, p. 169. From *Rev. App. Mycol.*, xxi., **10**, 1942, p. 443.) The bacillus recently shown by Cordon and Haenseler to produce a thermostable toxin active against *Rhizoctonia solani* (and regarded by them as a rough strain of *Bacillus simplex*) was found by the author to produce a thermostable diffusible substance which inhibited the growth of 77 out of 81 species of fungi. Actinomycetes were more tolerant to it than fungi, though some were completely inhibited. The majority of streptococci, staphylococci, bacilli, lactobacilli, and clostridia tested were suppressed by the toxic medium, but Gram-negative organisms were unaffected. *B. subtilis* and, to some extent, *B. cereus* and *B. pumilus* also produced thermostable substances toxic to *R. solani*. The toxic substance produced by Cordon and Haenseler's organism was completely adsorbed by soil, bentonite, and activated charcoal, partly by agar, and not at all by talc; it passed through cellophane, parchment, and collodion, resisted autoclaving for 30 to 45 minutes at 15 lb. pressure, but was rapidly destroyed by

heating in alkaline (less rapidly in acid) solutions. It was not inactivated by aeration and retained its potency for many months at 0° C. It was not removed from the toxic medium by ether, chloroform, benzene, ethyl acetate, or N-butyl alcohol, but was partially eluted from charcoal with 95 per cent. ethyl alcohol.

177. Studies on the Foot-Rot Disease of Cotton in the Punjab. By R. S. Vasudeva. (*Rpt. and Summ. of Proc. Ind. Cott. Conf.*, 1941, p. 165.) *Rhizoctonia* root rot is the most serious disease of cotton in the Punjab. Almost all Indian types and all the foreign types so far tested are severely attacked. Cottons are normally sown in May. The disease makes its appearance some time in June and continues to be vigorous during July. In August the attack slows down and almost ceases by the end of September. Attack may be evaded by sowing some time in the end of June or very early in the first week of April. Mortality is reduced to negligible proportions when *moth* (*Phaseolus aconitifolius*) is sown in between the rows. Plants which have wilted as a result of attack exhibit marked differences in chemical composition, but the only difference detected in soils bearing healthy and diseased plants is that the latter contain more acid-soluble calcium and have a higher Ca:Mg ratio.

[*Cf.* Abstr. in Vols. XIII. to XIX. of this Review.]

178. Diseases of Plants Recorded in Texas since 1933. By G. E. Altstatt. (*Pl. Dis. Rptr. Suppl.* 135, 1942. Mimeographed. From *Rev. App. Mycol.*, xxi., **11,** 1942, p. 481.) A list is given, arranged under the Latin names of the hosts, of the plant diseases caused by fungi, bacteria, viruses, or physiological factors, recorded in Texas since 1933. New host plants of the cotton root rot fungus (*Phymatotrichum omnivorum*) found since 1936 are included.

179. Texas: Cotton Root Rot Disease. By G. S. Fraps and J. E. Simpson. (*54th Ann. Rpt. Texas Agr. Exp. Sta.*, 1941, p. 23.) Cultures of the cotton root rot organism tolerated moderate amounts of salts of tin, tungsten, barium, and strontium, and large quantities of ordinary salt. Iron salts up to 100 parts per million stimulated growth of the organism, and in larger quantities decreased growth. Cobalt, nickel, and titanium in small quantities inhibited growth.

180. Antibiosis in the Elimination of *Phymatotrichum omnivorum* Sclerotia from Soil. By F. E. Clark and R. B. Mitchell. (Abs. in *J. Bact.*, xliv., **1,** 1942, p. 141. From *Rev. App. Mycol.*, xxii., **1,** 1943, p. 21.) At Greenville, Texas, uncontaminated, viable sclerotia of *Phymatotrichum omnivorum* survived equally well in sterile, unamended and organic-amended soils. In non-sterile, amended soil, incubation temperatures favouring general microbial activity were more destructive to the sclerotia, 12, 30, 72, and 91 per cent. of which succumbed at 2°, 12°, 28°, and 35° C., respectively; at 28°, soil moisture contents of 35, 58, and 80 per cent. were found to be effective in the order given. Materials with narrow carbon : nitrogen ratios provided equal inhibition of the sclerotia with those of wider ratios less likely to meet good crop nutrient requirements.

181. A Root Rot of Cotton caused by *Thielaviopsis basicola*. By C. J. King and J. T. Presley. (*Phytopathology*, xxxii., **9,** 1942, p. 752. From *Rev. App. Mycol.*, xxii., **1,** 1943, p. 21.) *Thielaviopsis basicola* was isolated and identified in 1938 from the purplish-black, rotted vascular tissues of cotton roots collected at Sacaton, Arizona, in 1922, the disease being further observed in 1940 in the Upper Gila River Valley, nearly 200 miles distant from the original focus. In cultures on various standard media the cotton isolates resembled those from tobacco of Tennessee and Missouri origin, though minor differences in the colour and density of the colonies were observed, and on onion agar the cotton strain produced white or buff-coloured sectors which did not develop in the tobacco strain. Under natural conditions the root rot, which is also characterized by a

swelling of the tap-root near the collar, persists in the soil from one year to another, even in the absence of cotton cultivation. The fungus spreads slowly, and the damage caused by it is not ordinarily severe, except occasionally in the spring on American-Egyptian seedlings, which may recover temporarily during the hot weather, the occluded lesions, however, tending to resume activity in the autumn and to destroy the mature plants. Cross-inoculation experiments with the cotton and tobacco strains of *T. basicola* on Maryland Broadleaf tobacco and Pima cotton were successful, nearly all the inoculated plants showing either external or internal symptoms of the root rot, though only a few died.

182. COTTON RUST IN ARIZONA. By J. T. Presley. (*Pl. Dis. Rptr.*, xxvi., **6**, 1942. Mimeographed. From *Rev. App. Mycol.*, xxi., **11**, 1942, p. 487.) During 1941 cotton rust (*Aecidium gossypii*) was present over a large area in Arizona, the outbreak being favoured by the prevailing weather conditions and the increased acreage of cotton on desert land. The *Bouteloua* grasses, which are alternate hosts of the fungus, are native to the south-west parts of the United States and may be expected to grow abundantly on most desert lands when water is supplied either by irrigation or rainfall. On ditch banks and in cotton fields where moisture is available the grass will grow for most of the summer, and reach a size many times that found in the desert; it is on this grass, in and immediately surrounding the cotton field, that most of the rust inoculum is built up. Directly a rainy period sets in, the teleutosori on the infected grass germinate and the cotton becomes diseased. Grass in a cotton field may be attacked early in the summer and re-infect the same field later in the same growing season, if weather conditions are favourable; teleutosori forming on the grass soon after infection are at once viable and may germinate within 48 hours. The following suggestions are made to assist in control. Dead, rusted grass in and round cotton fields should be destroyed by burning where possible, before the arrival of the summer rains, and improved sanitary practices instituted, especially with regard to ditch and fence rows. Fungicidal treatment, though possible, would be expensive and difficult.

[*Cf.* Abstr. **455**, Vol. XIX. of this Review.]

183. TIRAK DISEASE OF COTTON IN THE PUNJAB. See Abstract 17 in this issue.

184. CROSS INOCULATIONS WITH ISOLATES OF *FUSARIA* FROM COTTON, TOBACCO, AND CERTAIN OTHER PLANTS SUBJECT TO WILT. By G. M. Armstrong *et al.* (*Phytopathology*, **32**, 1942, p. 685. From *Pl. Bre. Abs.*, xiii., **1**, 1943, p. 31.) Cross inoculation with wilt Fusaria from *Cassia tora*, tobacco, cotton, okra, tomato, watermelon, and cowpea showed that, while those attacking the last three were pathogenic only to their respective hosts, isolates from *Cassia*, tobacco, cotton and okra caused wilt in one or more other hosts.

185. COTTON WILT IN ALABAMA AS AFFECTED BY POTASH SUPPLEMENTS AND AS RELATED TO VARIETAL BEHAVIOUR AND OTHER IMPORTANT AGRONOMIC PROBLEMS. By H. B. Tisdale and J. B. Dick. (*J. Amer. Soc. Agron.*, xxxiv., **5**, 1942, p. 405. From *Rev. App. Mycol.*, xxi., **10**, 1942, p. 450.) The average incidence of cotton wilt (*Fusarium vasinfectum*) at various localities in Alabama in which experiments were conducted for three years and upwards ranged from 45 to 83 per cent. in the highly susceptible variety, Half-and-Half, and from 9 to 56 in the weakly tolerant group, including Cook 1138, Rowden 2088, Deltapine 12 and A, Delpress 3, Missdel 1 WR, and Miller 610. At six out of the nine test sites no appreciable difference between the reactions of the resistant (including Cook 307, Cook Wiregrass, Dixie Triumph 12, Siker WR, and Clevewilt 6 and 7) and highly tolerant (Coker's 4 in 1, Dixie 14-5, Dixie Triumph 85, Toole, Cook 144-68, and Cook 1006) varieties could be discerned, but at the remaining three

the former group was clearly superior to the latter. The increased severity of infection among the tolerant-resistant groups in two out of three localities may be attributed to potash deficiency (50 lb. or less replaceable potassium oxide per acre), while in the third root-knot nematodes were suspected of contributing to the virulence of the disease. The relatively constant ranking of cotton varieties with respect to wilt infection at the various experimental sites, regardless of the general severity of the disease, is interpreted as evidence against the existence of physiologic races of the pathogens, matters of more practical concern to growers being the differential response of the varieties under observation to potash and the influence of seasonal and other environmental factors. In two localities where wilt was severe only on the susceptible (Farm Relief and Coker 100) and highly susceptible (Half-and-Half) varieties, increasingly heavy applications of potash (8 per cent. or more) gave good results, whereas at another place, where the disease was exceptionally virulent, such treatments were beneficial only to the resistant group, which responded equally well, however, on another site to moderate amounts, larger quantities being harmful. The Sea Island variety, for the one year in which it was included in the tests, was immune from wilt in one place and showed only a trace of vascular discoloration near the end of the season in another.

186. Estudo Sobre a Fusariose do Algodoeiro. By F. R. Milanez and J. Joffily. (*Rodriguesia*, V., **14.** Rio de Janeiro, 1941, p. 325. From *Rev. App. Mycol.*, xxii., **1**, 1943, p. 20.) The material used in the writers' studies of cotton wilt (*Fusarium vasinfectum*) was obtained from plants of the A.M.41 variety grown in soil heavily contaminated with aqueous suspensions of the hyphæ and spores of the pathogen, the presence of which was verified for the first time in Brazil in 1935. In all the sections examined the fungus was detected in the interior of the vessels, and as soon as the vitality of the adjoining tissues declined they were also invaded by the hyphæ. The penetration of the roots through layers of living cells is attributed to the death of the latter from the effects of fungal toxins. The multiplication of *F. vasinfectum* was observed in several regions of the vascular system from the root tracheæ up to the leaf veins, the midrib of one of the leaves inspected being so densely infested that some of the vessels appeared to be occluded. The paucity of fungal elements commonly found in the vascular system of diseased plants, however, is in accordance with recent views on the toxic action of *F. vasinfectum*. Microconidia, 4 to 9·4 by 1·4 to 2·2 μ, were observed, apparently for the first time, in the root tracheæ, petioles, and secondary veins of living plants attacked by the wilt disease. The importance of these organs, especially in the leaves, in relation to the spread of infection is emphasized. When sections of the inoculated plants were mounted in liquid paraffin between the slide and cover glass, the hyphæ continued to grow, giving rise to microcultures, macro- and microconidia often developing within twenty-four hours and chlamydospores in five or six weeks. *F. vasinfectum* would thus appear to share with *Aspergillus flavus* the property of utilizing liquid paraffin as a source of carbon and energy, and this characteristic may be of value in the diagnosis of cotton wilt and the isolation of its agent.

187. Memoria Anual de 1940 del Jefe del Departamento de Investigaciones de Algodon y Cereales, Estacion Experimental Agricola de la Molina, Lima, Peru. By T. B. Barducci. (*Rev. App. Mycol.*, xxi., **12**, 1942, p. 517.) The following items of phytopathological interest occur in the report. During the season of 1939 to 1940 studies were conducted on 26 Tanguis cotton selections and the progenies of 378 plants phenotypically resistant to wilt (*Verticillium* sp.), from which 13 of the former and 61 of the latter, besides 202 phenotypically immune individuals, were reserved for further trials in connection

with the work of breeding for immunity from the disease. The average percentages of wilt in the selections and control variety (Hualcará, current season) at 93, 121, 155, 188, and 212 days were 6·81, 16·28, 21·01, 22·11 and 87·21 and 10·81, 29·40, 40·93, 44·29 and 92·29 respectively. In 1933-4 and 1937-8 the maximum incidence of wilt developed during a period extending from 100 to 140 days after sowing, when the optimum soil temperature (22° C.) for the growth of the pathogen at a depth of 5 cm. to 1 m. prevails. In 1938-9 and 1939-40 the selected strains were not attacked during the critical period, indicating an increase in genotypic resistance.

188. South Carolina: Plant Disease Studies. (*S. Car. Sta. Rpt.*, 1941. From *Exp. Sta. Rec.*, **87**, 3, 1942, p. 378.) Reports progress in the study of diseases of cotton seedlings and bolls; mineral nutrition and *Fusarium vasinfectum* resistance in a susceptible and a wilt-resistant cotton variety; cross-inoculations with *Fusarium* wilt organisms; tests of new varieties of wilt-resistant cottons; self-pollination and selection of wilt-resistant lines of Super 7 cotton.

189. Tennessee: Cotton Wilt Studies. By C. D. Sherbakoff. (*52nd and 53rd Ann. Rpts.*, 1939 *and* 1940, Tenn. Agr. Exp. Sta. From *Rev. App. Mycol.*, xxi., **10**, 1942, p. 440.) In further regional studies on cotton wilt by the author in co-operation with the U.S. Department of Agriculture, the Dixie Triumph 12 and Clevewilt 6 varieties showed complete resistance to the disease over a 3-year period, whereas Miller 610 and Rowden 2088 were dependable in this respect only where infection was mild and a balanced fertilizer, including sufficient potash, had been applied; Coker 100 and Half-and-Half sustained severe injury even from slight attacks of the fungus.

GENERAL BOTANY, BREEDING, ETC.

190. Evolution, the Modern Synthesis. By J. Huxley. (George Allen and Unwin, Ltd., London, 1942. Price 25s. From *Pl. Bre. Abs.*, xiii., **1**, 1943, p. 96.) This book is based on a series of lectures given in 1936 to the British Association on "Natural Selection and Evolutionary Progress." It is, however, much more than this, since its 645 pages contain a wealth of information on all lines of modern genetical, cytological and taxonomic study that help to throw more light on the process of evolution. In particular the valuable work of R. A. Fisher is stressed in showing how the effect of a mutation can be altered by new combinations and mutations of other genes. The author states that any originality that his book may possess lies in attempting to generalize this idea and in stressing the need for the study of the effect of genes during development. Equally original is the presentation and analysis of a vast quantity of taxonomic data in the light of modern genetical and evolutionary theories. The presentation of the latest ideas on the species problem, geographical, ecological and genetical specification, evolutionary trends and evolutionary progress is of value to workers in every branch of biology. In the last chapter on evolutionary progress the author deals not only with evolutionary processes in plants and animals, he also applies this to man, realizing at the same time that the methods of evolutionary change, varying as they do for species with different modes of life and of differing degree of complexity, must with man be capable of conscious control; in man for the first time purposeful evolution is at least a possibility. The book ends with a large and useful list of references of thirty-five pages and is well indexed.

191. The Reproductive Capacity of Plants: Studies in Quantitative Biology. By Professor E. J. Salisbury. (G. Bell and Sons, Ltd., London, 1942. Price 30s. net. Reviewed *Nature*, vol. cli., 1943, p. 319.) In this volume the author has collected together measurements, accumulated over a period of

fifteen years, of the number of fruits and seeds produced by sample populations of a wide range of species of representative habitats, with the object of examining quantitatively the rough impressions and certain teleological assumptions that have gained currency. Among the leading questions propounded is whether the relative abundance and frequency of different species are correlated with their reproductive potentialities. On the other hand, since on the average the number of individuals of different species remains approximately stable, it has been commonly assumed that natural selection has brought about a nice adjustment between seed output and mortality. Is reproductive potentiality in fact proportioned to vulnerability, or is the production of a large progeny rather to be regarded as merely wasteful ? The complexity of the problems is made apparent from the outset. The author points out, for example, that fluctuation in number of offspring has the effect of countering the danger from predators. Though " mast " years lead ultimately to an increase in number of predators, the inevitable lag enables the sudden abundance to be effective in increasing the number of individuals, at least temporarily, and possibly securing the spread of the species. Another complicating factor is seed size, which is examined and discussed in Chapter 2. It is established that the more advanced the phase of ecological succession the larger are the seeds, on the average, of the species characterizing the vegetation; and the author points out that the smallest seeds are to be found among plants of open habitats, and also among parasites, saprophytes and mycorrhizal plants, which are not dependent for survival on early photosynthesis. In Chapter 3 it is shown that parental vigour, estimated by the number of fruits borne, has no significant effect on the viability of the seeds set and very little on their size. Apparently, below a certain minimum of food supply an ovule or seed aborts and the effect of starvation is seen in fewer seeds of nearly normal size. Having defined his terms, of which the most important is reproductive capacity, the product of the average seed output per plant and the average percentage germination, the author then examines the data for different edaphic and climatic conditions and the effects of competition. He remarks that competition may sometimes be the more important, and gives examples of perennials in which the onset of reproduction is delayed for years by competition. Between individuals of the same species, on the other hand, while competition leads to depauperate individuals, it affects the total output but little whether many small or few large plants survive. In Chapter 7 it is established that no correlation exists between number of capsules per plant and number of seeds per capsule. The remainder of the book is devoted to a comparative study of reproductive capacity over a wide range of examples. The general conclusion frequently emerges that there is no evidence of reproductive capacity being correlated with risk of mortality, but definite evidence of correlation with extent of geographical range (*e.g.*, Scilla spp.) and with relative abundance (*e.g.*, Hypericum spp., Gentianaceæ). Vegetative spread and multiplication complicate comparisons and receive special discussion in the concluding chapter. The discussions of special cases are full of interest and are informed throughout with original observations which add greatly to the value of the book. To the general reader it may be a matter of regret that the statistical data are given *in extenso* throughout the text. The summaries and, still more, the many comments and original observations are in consequence more difficult to pick out. While it is desirable that data so laborious of collection should be permanently preserved and accessible, the value of the book would, it is suggested, have been increased had the bulk of the data been segregated.

192. Cytology and Cell Physiology. By G. Bourne (Editor). (Clarendon Press, Oxford, 1942. Price 20s. From *Pl. Bre. Abs.*, xii., **4,** 1942, p. 292.) This book is well described by a paragraph in the preface: " In this book an

attempt has been made to bring together chemical, physicochemical, and morphological aspects of the study of cells. It has not been the aim to cover the whole field of cytology or of cell chemistry; indeed, it would take a series of volumes to do so. The best that one can do is to choose a number of subjects which are representative of different fields of the study of cells and which relate, as far as possible, one to the other, and to bring them together within a single cover." The separate chapters are all well written, but, good though the individual contributions are, one is left with the impression that a somewhat greater effort should have been made to link them together. The book is, however, a valuable one and merits the attention of all cytologists and experimental biologists. The unfamiliarity of much of the material should broaden the outlook of many workers and suggest to them new fields of investigation in their own specialist branches.

The following are the contents of the book: "Some aspects of cytological technique" (J. R. Baker); "Physical and physicochemical studies of cells: Part I.—General" (J. F. Danielli), "Part II.—Monolayer technique" (J. H. Schulman); "The cell surface and cell physiology" (J. F. Danielli); "Mitochondria and Golgi apparatus" (G. Bourne); "Nucleus, chromosomes and genes" (M. J. D. White); "Micro-incineration and the inorganic constituents of cells" (E. S. Hornung); "Enzyme systems of cells" (H. Blaschko and W. Jacobsen); and "Pathological aspects of cytology" (R. J. Ludford). Plant geneticists and cytologists will be familiar with most of the work described in White's excellent chapter, but they will find points of special interest to them in the chapters by Baker and Bourne. The book includes a list of references, an index of authors and of subjects. The production is of the usual high standard to be expected from the Oxford University Press.

193. TEXAS: CYTOGENETICS AND IMPROVEMENT OF COTTON. By J. O. Beasley and T. R. Richmond. (*53rd Ann. Rpt. Texas Agr. Exp. Sta.*, 1940, p. 72.) A hexaploid produced by doubling the chromosome number with colchicine in a hybrid of *G. hirsutum* × *G. anomalum*, a wild African species, had remarkably regular meiotic chromosome behaviour, a pollen fertility of about 85 per cent., fibres finer than Upland and with finer convolutions, but the yield of fibres was too low for the hexaploid to be of commercial value. The hexaploid has been backcrossed twice to Upland. Seeds produced from plants of *G. arboreum* (Nanking Asiatic cultivated) × *G. thurberi* (Wild American) in which the chromosome number was doubled and crossed with *G. hirsutum* (Coker 100) and backcrossed to the *G. hirsutum* gave an extremely variable population. Some of the plants were prolific, but the percentage of lint was low. The fibres of some of the plants were finer than those of the Upland parent, had fewer convolutions, and were stronger. Self-pollinated seeds were produced on these plants and the more promising ones were transferred to the greenhouse, where they are being backcrossed again to Upland.

About 30 plants from a hexaploid of Upland (Half-and-Half) × Asiatic (Nanking) backcrossed twice to Upland gave a range in fertility from 0 to more than 50 per cent. All the plants examined had over 26 pairs of chromosomes, and some had 4-5 extra ones (from the Asiatic parent). As many as possible of the plants were self-pollinated and also backcrossed again to the Upland parent. Some of the plants had fibres coarser than Upland, and others showed some of the resistance to angular leafspot possessed by the Asiatic parent. Plants selected for high fertility in the F_2 of a hexaploid of *G. hirsutum* (Half-and-Half) × *G. arboreum* (Nanking) gave progenies with approximately the same percentage of sterile plants as the F_2 progeny. Doubling the chromosome number in a plant in which about half of the homologous chromosomes failed to pair did not increase the percentage of chromosomes that pair. This indi-

cates that doubling chromosome number does not increase chromosome pairing in plants in which pairing is interfered with by a gene combination. Doubling chromosome number in hybrids in which pairing is prevented by different arrangement of genes in the chromosomes is followed by approximately normal pairing.

194. CYTOGENETICS AND IMPROVEMENT OF COTTON. By J. O. Beasley and T. R. Richmond. (*54th Ann. Rpt. Texas Agr. Exp. Sta.*, 1941, p. 14.) In 1941 six species hybrids were produced in addition to the ones already available at this Station. From some of these sterile hybrids and hybrids produced earlier, seven additional polyploids were produced, three of which are considered new species. Seven polyploids produced from American Upland and wild species on Asiatic cultivated cottons have been backcrossed one to three times in attempts to transfer genes of economic value to American Upland types. Some of these progenies showed no infection of angular leafspot. A few plants from the second backcross of a hybrid involving the wild cotton from South-Western United States and American Upland cotton had fibres with a strength index equal to that of fibres of Sea Island cotton. From the backcross work in which hexaploids were backcrossed to American Upland, which is tetraploid, one or more generations can be eliminated by using the first backcross, a pentaploid, as the pollen parent. In a population grown from seeds produced by pollinating normal flowers of Rogers Acala with X-rayed pollen, one haploid was found. If this haploid was the result of X-raying pollen the frequency of the haploids is too low to be of commercial value. The chromosome number has been doubled in haploids of three Upland varieties, Acala, Stoneville, and Mexican, to produce pure lines.

[*Cf.* Abstr. **202**, Vol. XVIII., and previous abstract.]

195. NEW PATHS IN GENETICS. By J. B. S. Haldane. (George Allen and Unwin, Ltd., London, 1941. Price 7s. 6d. From *Pl. Bre. Abs.*, xii., **4**, 1942, p. 291.) This book is based on a series of lectures given at Groningen in 1940. It gives a very lucid and interesting account of several aspects of genetics, in the development of which Professor Haldane has been specially concerned, though of course it is in no way limited to the results of his own research. Nearly all the material in it has been published separately, but, in view of the immense practical importance of the problems discussed, it has a very real value in connecting together scattered publications. Particular emphasis is placed on the value of combined genetical and biochemical studies as an aid to the understanding of physiological processes. Studies of certain human abnormalities such as phenylketonuria, alcaptonuria, etc., and the flower pigment work carried out by Scott-Moncrieff, Robinson, and others, are cited at length. The specific mode of action of various genes in development receives considerable attention, and many examples are cited, particularly in poultry and rodents. It is shown that genetic mutants form very valuable material for the physiologist who is studying the complicated interrelations involved in either normal or abnormal development. The last two of the five chapters of the book deal with human genetics. Examples of the various modes of inheritance of genetical defects are given, and the mathematical relations between mutation and selection are discussed, with particular reference to the possibility of reducing the various types of abnormality by means of negative eugenics. The effect of the change in fairly recent years from a state in which marriages took place almost entirely within small, isolated communities, to one in which mating is more nearly at random, is discussed. Gene linkages and suspected linkages in man are dealt with in the last chapter, and particularly Haldane's own discovery of partial sex linkage and the beginning of chromosome mapping. Some indication of the complexity of calculating linkages in human pedigrees is given.

196. Abstracts of Papers, 1915-1941. By S. C. Harland. (*Soc. Nac. Agraria Inst. Cott. Genet.*, 1. Peru, 1942. From *Pl. Bre. Abs.*, xiii., **1**, 1943, p. 55.) Abstracts are given in English of all the papers published by the author during the period 1915-41.

197. Indore Institute of Plant Industry: Research Work, 1940-41. (*Ann. Rpt. Ind. Cent. Cott. Comm.*, 1940-41.) *Cotton Genetics.*—Five genes responsible for lintlessness in Asiatic cottons have been identified and, while some of the interrelationships among them have been worked out and published, work is in progress to complete the study and to determine the linkage relationships of the several lintless genes to other known genes. Data obtained last year from the study of a single F_2 family indicated that there was free assortment between 1027 lintless gene li_a and the anthocyanin gene R; this was confirmed during the year from the study of a larger F_2 population, showing definitely that the lintless gene li_a is not linked with anthocyanin locus in Asiatic cottons. The independent segregation of this gene with lint colour gene K was also confirmed in a cross with narrow *Kokati* type. The study of the crosses with *arboreum* lintless types has indicated that wherever there is segregation of hairy linted and hairy lintless there is a significant deficiency of the latter group which can only be explained as being due to the action of modifiers whereby some lintless plants appear as linted. . . . The differences in viability according to environment in the normal linted, short linted (heterozygous) and lintless (homozygous) types, reported last year, were tested in two replicated experiments, at Indore and Sri Ganganagar respectively. No difference in viability was reported among the three types at Ganganagar, but at Indore normal linted was more viable than short linted, and short linted than lintless. . . . The three types, normal linted, short linted and lintless, had different growth rates and the final heights attained by the plants were in the order, linted, short linted and lintless. The effect of the lintless gene is to shorten the internodes, making the plant appear dwarfed.

In crosses made between Buri naked (really tufted) with two fully fuzzy types, C.920, M.U.4, to study the inheritance of fuzziness, the F_1 and F_2 means and the F_3 behaviour gave an indication of the non-fuzzy nature being dominant. Studies on several crosses with a type Tellapathi (*G. arboreum* var. *neglectum* forma *indica*) obtained from Coimbatore showed it to be a new member of the anthocyanin multiple allelomorphic series. It is designated R_2^{GS} and is characterized by the absence of a leaf spot and pigmentation in stamen filaments. R_2^{GS} is complementary with R_2^{OS} for the production of pigment in stamen filaments and leaf spot. The significant increase in the ginning percentage as a result of X-raying seeds of M.U.4 and Upland cottons for 20 minutes was again manifest during the year.

The *arboreum* strains, Malvi, Bani and C.520, on which considerable work has been done in regard to quantitative inheritance, were utilized for determining the physiological basis underlying the manifestation of hybrid vigour. The three parents and their reciprocal F_1s were grown during the year in a randomized and replicated experiment and the following observations were taken: Plant height every 15 days, leaf area, dry weight of leaves and stems separately and dry weight of reproductive parts on random duplicate plants taken from each plot at intervals of 20 days. A rough examination of the data indicated that it was the increased meristematic capital with which the hybrids started which accounted for the manifestation of vigour. This was more apparent in the cross Malvi $\times$ C.520, where, due to greater parental differences in seed weight and meristematic tissues, the differences between the reciprocal F_1 were very striking.

198. Some Observations on Gene Variability and Spontaneous Mutation. By L. J. Stadler. (*Spragg Memor. Lectures Pl. Bre.*, Mich. Sta. Coll. (1939), 1942,

p. 3. From *Pl. Bre. Abs.*, xiii., **1**, 1943, p. 24.) "The experimental analysis of gene mutation is not necessarily a technical impossibility. The mutations which occur spontaneously produce alleles of definite and distinctive properties; their apparent rarity may be only a consequence of the crudeness of our methods of detecting variability. In the case of some genes it may be feasible to determine the frequency of mutation from and to various distinct levels and types of activity, and to compare in detail the physiological action of the parent and the mutant alleles. Intensive studies of these two kinds should yield results on the basis of which specific hypotheses of gene structure and gene action may be formulated and experimentally tested."

199. Nucleoli and Related Nuclear Structures. By R. R. Gates. (*Bot. Rev.*, **8**, 1942, p. 337. From *Pl. Bre. Abs.*, xiii., **1**, 1943, p. 25.) The review includes reference to the following aspects: nucleolar size (special reference to wheat and rice varieties); nucleoli and satellites (tables of species in which apparent diploids with four nucleoli are recorded); and the phylogenetic significance of nucleoli. It is concluded that the number of nucleoli in the cells of a species is probably as important phylogenetically as the number of chromosomes. Future reports of chromosome numbers should include at least a determination of the number of SAT chromosomes, the number of secondary constructions and the number and sizes of the nucleoli in somatic telophase.

200. Chromosome Degeneration in Relation to Growth and Hybrid Vigour. By D. F. Jones. (*Proc. Nat. Acad. Sci., Wash.*, **28**, 1942, p. 38. From *Pl. Bre. Abs.*, xiii., **1**, 1943, p. 24.) The question of heterosis is re-examined in the light of recent research. The depressive effect of inbreeding is thought to be due to chromosome deficiencies too small to have any other visible effect. The fact that almost all combinations of inbred parents give heterosis shows that the number of loci which may be deficient is exceedingly large.

201. The Distribution of X-Ray-induced Chromosomal Aberrations. By K. Sax. (*Proc. Nat. Acad. Sci., Wash.*, **28**, 1942, p. 229. From *Pl. Bre. Abs.*, xiii., **1**, 1943, p. 24.) Multiple aberrations were much less frequent than was expected in X-rayed material, while ring chromosomes were more frequent than would be expected. The factors determining the frequency of effective breaks are thought to be (*a*) the spatial relations of the chromosome, (*b*) the stresses imposed by the centromere in maintaining polarity and (*c*) the stage of chromosome development in the nuclear cycle.

202. Meiotic Chromosome Behaviour in Species, Species Hybrids' Haploids, and Induced Polyploids of *Gossypium*. By J. O. Beasley. (*Genetics*, **27**, 1, 1942, p. 25. From *Exp. Sta. Rec.*, **87**, 2, 1942, p. 208.) The meiotic chromosome behaviour is regular in 13-chromosome species of *Gossypium*, but a few irregularities occur in 26-chromosome species. In meiosis of autopolyploids about two-thirds of the chromosomes form quadrivalents. In a haploid of a 26-chromosome species a maximum of five pairs of chromosomes was found. In hybrids between species, amount of chromosome pairing varies from complete to almost none. In hybrids with a reduced amount of pairing there was evidence that structural differences existed among some of the chromosomes, and in some species hybrids apparently all the chromosomes were structurally dissimilar. Most chromosomes formed bivalents in polyploids that were produced from hybrids with a reduced amount of chromosome pairing. Usually, however, cells in first metaphase and anaphase had one or more anomalies. The tetraploid species of *Gossypium* have one set of chromosomes similar to the set in Asiatic 13-chromosome species and the other set like that in American 13-chromosome species. The species of *Gossypium* are separated

into six general types chiefly on the basis of chromosome pairing, structure (arrangement of genes), and chromosome number. The degree of relationship of the types is discussed. Structural changes in the chromosomes probably had little importance in the initial speciation of *Gossypium*.

[*Cf.* Abstrs. **542, 543, 559,** Vol. XVII., **515,** Vol. XIX. of this Review.]

203. Cromosomios do Algodoeiro "Quebradinho." By O. C. Góes. (*An. 1ª Reun. Sul-Amer. Bot., Rio de J.*, 1938, **3,** p. 326. From *Pl. Bre. Abs.*, xiii., **1,** 1943, p. 56.) The somatic number 52 was established in the variety Quebradinho, extensively grown in the north-east of Brazil, and it is thought to be related to the American group *G. hirsutum* L., *G. purpurascens* Poir. and *G. barbadense* L. Descriptions and illustrations of the chromosomes are given.

204. The Present Status of Synapsis and Chiasmatypy. By E. C. Jeffrey and E. J. Haertl. (*Amer. J. Bot. Suppl.*, 1941, **28.** From *Pl. Bre. Abs.*, xiii., **1,** 1943, p. 25.) The generally accepted view that the chromosomes pair side by side is apparently without sound foundation, since the meiotic chromosomes have exactly the same organization as the reproductive chromosomes, the chromosomes of the gametophyte, the endosperm, and the sporophyte. It is obvious, accordingly, that in the meiotic divisions there is a splitting of chromosomes, not a fusion. Consequently it seems inaccurate to speak of parasynapsis (conjugation); since parasynapsis does not take place, the chiasmatypy hypothesis ceases to be valid.

205. Amphidiploidy. By T. H. Goodspeed and M. V. Bradley. (*Bot. Rev.*, **8,** 1942, p. 271. From *Pl. Bre. Abs.*, xii., **1,** 1943, p. 25.) Discusses the origin of amphidiploidy and its experimental induction; the origin and character of naturally occurring amphidiploids; their morphological and physiological characteristics; the cytogenetics of amphidiploids; fertility and "crossability"; and the evolutionary significance and distribution of amphidiploids.

206. Ecological Significance of Polyploids. By H. Kihara. (*Study of Ecology*, **5,** 2, 1939, p. 147. From *Pl. Bre. Abs.*, xii., **4,** 1942, p. 231.) Reference is made to the findings of various investigators of the geographical distribution of polyploid plant forms and their relation to environment.

207. Cotton Fibres: Shrinkage and Cell-Wall Structure. By E. E. Berkley. (*Amer. J. Botany*, **29,** 1942, p. 416. From *Summ. Curr. Lit.*, xxii., **21,** 1942, p. 510.) Longitudinal shrinkage of cotton fibres, when dried from the green to the air-dry and oven-dry conditions, was measured on seven varieties of *Gossypium hirsutum* and *G. barbadense* collected at frequent intervals beginning 10 days after the flowers opened. At the age of 10 days shrinkage was 35 to 40 per cent. From the 10-day period to the time of secondary thickening the shrinkage gradually decreased. Removal of waxes or pectic substances increased the shrinkage. There was a decrease in shrinkage when the fibres were dewaxed and then treated with boiling 1 per cent. caustic soda for one hour. Bundles of fibres containing primary wall only increased in length in 18 per cent. caustic soda; fibres containing secondary thickening decreased in length under this treatment. Fibres with primary walls only elongated in cuprammonium solution, but fibres with secondary thickening decreased in length. The results are held to confirm the microscopic and X-ray studies which show that the crystalline cellulose of the primary wall lies transverse to the long axis of the fibre or in a low spiral around the fibre. They also indicate that only a small percentage of the primary wall is crystalline cellulose.

208. Variations in the Length of Cotton Fibre in the Direction of Selection. By M. A. Ol'sanskii. (*Jarovizacija*, **2** (35), 1941, p. 101. From *Pl. Bre. Abs.*, xii., **4,** 1942, p. 261.) In 1934 lint length was measured in 42 F_4

plants from the cross Pioneer 915 × Schroeder 1306; it varied in the different plants from 20·0 to 26·0 mm. The 42 F_5 families were sown separately and their mean lint length was 24·4 mm. The four best families with an average length of 24·8 mm. were selected. Further selection was repeated each year and raised the mean lint length to 31 mm. with variations from 28 to 35 mm. by 1940.

209. Influence of High Temperatures on Viability of Pollen in Cotton (in Relation to Premature Fruit Dropping). By S. S. Abaeva. (*C.R. [Doklady] Acad. Sci. U.S.S.R.*, **32,** 1941, p. 443. From *Pl. Bre. Abs.*, xiii., **1,** 1943, p. 56.) The effect of high air temperatures under normal conditions of growth upon pollen viability (which may lead to premature shedding of the fruit) was studied with an Upland cotton No. 8517 and an Egyptian variety No. 35-1. Both varieties gave similar results. From a total of 30 determinations it was found that pollen from flowers that had been kept at a temperature over 41-42° C. failed to germinate on the stigma of a normal but previously emasculated flower. The best germination was obtained with pollen kept at 35-37° C. Owing to the time of incidence of high temperatures (over 40° C.) in cotton-growing districts in Russia (11-12 o'clock noon) and to dehiscence of the anthers of most of the flowers by 8 a.m., pollination can proceed normally, except in regions where unfavourable weather conditions may occur with effects resulting in too high temperatures and dry atmosphere throughout the morning hours.

210. Causes Underlying Bud and Boll Shedding in Cotton and Means to Control it. By V. A. Novikov. (*C.R. [Doklady] Acad. Sci. U.S.S.R.*, **32,** 1941, p. 148. From *Pl. Bre. Abs.*, xiii., **1,** 1943, p. 56.) The physiological aspect of the problem mainly is discussed, as well as the results of studies of conditions and factors favourable to shedding, including transpiration. Varieties of cotton characterized by intense transpiration are stated to be likely to be more resistant to high temperatures and therefore less prone to shedding. Egyptian varieties shed less than American cottons. Measures that promote transpiration are recommended as a preventive of the defect. In breeding for non-shedding varieties special attention should, it is suggested, be paid to forms in which transpiration, rate of photosynthesis, and formation of vitamins are high, and the selected forms must also be characterized by high suction pressure of buds and bolls and by a well-developed root system such as is found in the Egyptian varieties.

211. Intra-varietal Crossing in Cotton. By K. I. Tsinda. (*Jarovizacija*, **2** (35), 1941, p. 51. From *Pl. Bre. Abs.*, xii., **4,** 1942, p. 260.) The first generation from intra-varietal crosses in four varieties of *Gossypium barbadense* made in 1937 showed a greater energy of germination, and gave increases in yield of raw cotton varying between 1·45 and 5·44 c. per ha.; their yield was also of a higher quality, a greater proportion of it being picked before the frosts. Maarad gave the greatest yield increase, the variety 12761 the least, Pima and 2 Iz being intermediate. In the following generation differences in yield were still evident, and varied from 3·08 to 3·44 c. per ha. No difference was observed in size of boll, lint length or ginning percentage. The experiment was repeated in 1938 with Maarad, 2 Iz and three varieties of *G. hirsutum* L., 36 Me, 8517, and 1306. Local Turkmen material served in each case as maternal parent, and was pollinated from material reproduced elsewhere. This gave much greater yield increases than crosses between the local material. Maarad was especially improved as regards earliness by crossing. Different results were often obtained with material from different localities. The greatest differences were observed when the progenies were grown under the most favourable conditions.

212. Degeneration within Cotton Varieties. By J. F. O'Kelly. (*J. Amer. Soc. Agron.*, **34,** 1942, p. 782. From *Pl. Bre. Abs.*, xiii., **1,** 1943, p. 56.) Standard

varieties of cotton were tested to determine what changes occur within the variety when mixing with others is prevented. No evidence was obtained that a variety of recent hybrid origin will change more rapidly than others.

213. Degeneration of Industrial Varieties of Cotton. By I. R. Krasovskii. (*Jarovizacija*, **2** (35), 1941, p. 47. From *Pl. Bre. Abs.*, xii., **4,** 1942, p. 260.) Descriptions are given of various off-types found in élite material of a number of cotton varieties. Many of them were sterile or of reduced fertility. The élites were grown under conditions designed to preclude out-pollination and the degeneration is ascribed to the élites being produced from the progenies of two or three single plants, which reduced their range of adaptability. A much larger number of plants is now taken as the basis for élite production so as to avoid this danger, and the application of intra-varietal crosses is recommended.

214. Withdrawal of Water from the Fruit by the Leaves of Cotton. By V. A. Novikov. (*Compt. Rend.* [*Dok.*] *Acad. Sci. U.S.S.R.*, n. ser., **32,** 4, 1941. From *Exp. Sta. Rec.*, **88,** 1, 1943, p. 30.) Results of the four tests reported appear to indicate that water is drawn from the bolls on wilting of the plant, and that the main part of it is absorbed by the leaves. The bolls of Egyptian cotton, containing more water than American varieties, suffered less from dehydration. The fact that Upland cotton has a tendency toward forming the abscission layer in the peduncle is explained partly on the basis of a high water loss from the bolls when the leaves are in need of it.

215. Breeding of a Cotton Immune from Natural Crossing. By S. C. Harland. (*Nature*, **151,** 1943, p. 307.) Balls (*The Cotton Plant in Egypt*, 1912) made the discovery that in the cotton plant, self pollen was somewhat prepotent over foreign pollen in interspecific crosses between Egyptian cotton (*Gossypium barbadense* L.) and Upland cotton (*G. hirsutum* L.). Thus if stigmas of *barbadense* were pollinated with a mixture of *barbadense* and *hirsutum* pollen, most of the ovules were fertilized with *barbadense*. The reverse was found with *hirsutum*. The prepotency of self pollen over foreign pollen was rediscovered by Jones some years later in maize, and other plants are now known to follow this rule. But Balls went farther and showed that some F_1 pollen was prepotent over self pollen, though he did not deduce any theoretical consequences from this fact. This observation made the writer believe that in an interspecific cross there must be segregation for velocity of pollen tube growth conditioned by minor modifiers (now called polygenes by Mather). If there were many minor genes for velocity it should be possible to concentrate them by stringent selection and produce new types in which self pollen grew so rapidly that no foreign pollen would grow fast enough to fertilize. The plan adopted was as follows, and the experiments lasted from 1929 to 1935, when the writer left Trinidad.

Upland:	*y*, cream corolla.	*Barbadense*:	*Y*, yellow corolla.
	p, cream pollen.		*P*, yellow pollen.
	s, spotless corolla X.		*Sf*, faint spot.
	r, green plant body.		*R*, red plant body.

The F_1 showed dominance of *Y*, *P* and *R*. *Sf* could not be usefully employed because penetrance was too low.

The first backcross of F_1 on to the triple recessive hirsutum Upland. The female triple recessive was selfed at 8 a.m., much pollen being applied. Afterwards F_1 pollen was applied at intervals of one hour later, two hours later, etc., to eight hours later. Approximately ten bolls with roughly 210 seeds was the objective from each of the treatments. The nature of the results can only be given approximately owing to the loss of the writer's notes on leaving Trinidad. It was found that a considerable number of F_1 pollen tubes could beat the self tubes

even when the latter had four hours' start. A hundred plants were grown from each treatment, making eight hundred in all. Approximately eleven plants of composition *R*, *Y*, *P*, *r*, *y*, *p* were secured from the four-, five-, and six-hour treatments.

For the *second backcross* on to *hirsutum* triple recessive a mixture of pollen from all the eleven plants was used. Though the exact numbers are not available, the results indicate that a *much greater number of foreign tubes* were able to fertilize at the four-, five-, and six-hour intervals.

For the *third backcross* the pollen of ten *R Y P r y p* plants was mixed and applied at the same intervals after self-pollination. The number of plants from foreign pollen was slightly superior to the number in the second backcross, and the whole population was Upland in most of its characteristics.

The self population.—All plants resulting from the four-, five-, and six-hour treatments, about 60 in number, were self-fertilized and grown in progeny rows. All triple recessives were self-fertilized to create a series of lines identical with Upland except for the presence of the rapid pollen tube genes. Five plants only were available to continue the experiment. Progeny rows of these were interspersed among a collection of mixed hybrids of *hirsutum*, *barbadense* and *purpurascens* ancestry. If success had been obtained in concentrating some of the rapid pollen tube growth genes, some plants in these five rows would breed true to type *r y p* and vegetative characteristics, and could therefore be termed immune to natural crossing. The experiment was interrupted at this point, but has recently been resumed. Its practical importance for application to other crops is obvious.

216. Factors in the Breeding of Cotton for Increased Oil and Nitrogen Content. By N. I. Hancock. (*Tenn. Sta. Circ.*, 79, 1942. From *Exp. Sta. Rec.*, **87**, 5, 1942, p. 663.) Data from varietal studies with cotton in three localities in Tennessee are analysed and discussed in relation to factors involved in improvement by breeding of the oil and N contents of cottonseed. Both the oil and N content of cottonseed have been shown to be definite plant characters stable within the variety but differing significantly among varieties. The inverse relationship of the oil to N character is attributed largely to their non-compatibility with the environment—a wet, cloudy season being favourable to oil but unfavourable to N. Seasons appear to exert more influence upon this inverse relationship than do locations. The possibility of obtaining a variety high both in oil and N content is mentioned.

217. Cotton Breeding for Mechanical Harvesting. By H. P. Smith and D. T. Killough. (*Mech. Eng.*, **64**, 1942, p. 604. From *J. Text. Inst.*, November, 1942, A494.) Basic requirements of a mechanical cotton harvester are outlined and various plant characteristics that affect machine operation are listed. Difficulties of harvesting cotton mechanically and the influence of varietal and plant characteristics on the efficiency of mechanical harvesting are discussed. It is pointed out that an ideal plant type for all methods of harvesting is one having relatively short-noded fruiting branches 8 to 10 inches long, no vegetative branches, open-type growth, light foliage, storm resistance, and a medium to large strong boll borne singly on a peduncle that will snap easily under tension but will withstand plant agitation. Reference is made to suitable strains recently developed by cotton breeders at the Texas Station and to tests with the Texas Station harvester, which is of the stripper type.

[*Cf.* Abstr. **364**, Vol. XIX. of this Review.]

218. A Note on *Gossypium brevilanatum* Hoch. By J. B. Hutchinson. (*Trop. Agr.*, January, 1943, p. 4.) A strain of *Gossypium brevilanatum* Hochreutiner was established in 1939 at the Cotton Research Station, Trinidad, from seed supplied by Prof. Chevalier of the Musée d'Histoire Naturelle, Paris. This

interesting cotton relative is indigenous, but apparently rare, in Madagascar. After many unsuccessful attempts to obtain fresh seed, Prof. Chevalier kindly forwarded seed taken from herbarium specimens several years old. These germinated excellently, and a number of plants were obtained. In vegetative characters they resemble *G. kirkii* very much more closely than other species of *Gossypium.* The following is a description of the more important characters:

G. brevilanatum.—Woody shrub. In Trinidad growing to about 2 m. tall, usually unbranched until near the top. Stem not very strong, sprawling if left unsupported. Probably a sprawling shrub in its native habitat. Stipules small, falcate and persistent. Fruiting branches short sympodia, usually with three or four joints, bearing brilliant orange-yellow flowers. Bracteoles small (2 cm. or less). Flowers not widely expanding. Stigma lobes free, not dilated or capitate, not usually spreading. Capsules about twice as long as broad, usually 5-locular, surface irregularly pitted; hairs on the capsule sutures few and inconspicuous. Seeds 8 or 9 per loculus, covered with a single coat of fine light brown hairs up to 12 mm. long.

Chromosome counts were made in root tip material by R. M. Madoo. Root tips were fixed in "Craf" and stained in gentian violet. A typical plate is reproduced in the note as Fig. 1. The somatic chromosome number was found to be $2n=24$ (checked on 17 plates). A pair of long chromosomes was a marked feature of every plate examined. As was expected, *G. brevilanatum* agrees with *G. kirkii* in chromosome number, and not with the true cottons. Plates of *G. brevilanatum* were compared with Skovsted's preparations of *G. kirkii.* Apart from the occurrence of one pair of long chromosomes in *G. brevilanatum* there was little difference in chromosome size between the two species. *G. kirkii* and *G. brevilanatum* differ in a number of characters, the more important of which are tabulated below:

Character.	*G. kirkii.*	*G. brevilanatum.*
Stipules	Large, oblique, clasping stem.	Small, falcate.
Bracteoles	Almost as long as the petals.	Very much shorter than the petals.
Stigmas	Free, spreading.	Free, erect.
Capsules, shape ..	About as broad as long.	Half as broad as long.
Suture hairs ..	Copious, almost filling the cavity.	Few and inconspicuous.
Seeds per loculus	2	8-9

G. brevilanatum grafts easily on *G. kirkii*, but attempts to graft *G. aridum*, *G. arboreum*, *G. hirsutum* and *G. barbadense* on *G. brevilanatum* stocks all failed. (It is of interest to note that the Hawaiian *Kokia rockii*, which is a relative of *Gossypium* with 12 pairs of chromosomes, will graft on to *G. kirkii.* A good union results, but there does not appear to be free translocation from scion to stock, as the root dies unless a branch of *G. kirkii* is left.)

Attempts were made to obtain hybrids between *G. brevilanatum* and *G. kirkii*, and *G. brevilanatum* and cultivated New World cottons; 179 flowers of *G. kirkii* were pollinated by *G. brevilanatum.* The young bolls developed to some extent, but all fell off within about 2 weeks of pollination. At the same time attempts were made to cross two forms of *G. kirkii* that only differ slightly from each other; 46 flowers were pollinated, and all were shed within about 2 weeks. Since inter-crosses within *G. kirkii* failed, no great significance can be attached to the failure of crosses between *G. kirkii* and other species of *Gossypium*; 11 flowers of various types of *G. hirsutum* and 7 types of *G. barbadense* were also pollinated by *G. brevilanatum*; all were shed in 3 or 4 days.

219. Indian Cottons: Breeding for Wilt Resistance. (*Ind. Frmg.*, iii., **8**, 1942, p. 442.) Investigations carried out at Dharwar have shown that cotton

wilt is primarily due to the parasitism of the soil-borne fungus, *Fusarium vasinfectum*, and that a close relationship exists between the disease and the soil temperature. The indigenous cottons are susceptible to the disease to a greater or lesser extent, while the exotic cottons have proved to be immune to it. As a result of work on the development of resistant varieties, indigenous varieties possessing desirable agricultural characteristics and showing a high degree of wilt-resistance have been produced and given out for general cultivation in each cotton-growing area where wilt is a serious problem. Some of the well-known resistant types produced by cotton breeders of the Agricultural Departments are Jayawant, which is grown in the Karnatak, Jarila in Khandesh, BD 8 in Broach, and Verum 434 in the Central Provinces and Berar. Experience has, however, shown that the conditioning factors of environment—viz., degree of soil infestation by the pathogen and soil temperature, which greatly modify the expression of the disease—vary from season to season, and that selection in the field, therefore, does not provide a final basis for sifting plants resistant to disease from those that escape it. A technique for the isolation of 100 per cent. wilt-resistant types under optimum conditions in a glasshouse specially fitted with temperature controls has been developed at Poona. It provides for the testing of strains in three stages—viz., the development of wilt-resistant strains of good quality and yield by the cotton breeders from wilt-sick plots; the testing of these at Poona under optimum conditions of infection, and reselection of immune types from the highly resistant material furnished by the breeders; the final testing of strains selected at Poona in the respective tracts for wilt immunity and other agronomic characters. Tests over a series of seasons have shown that strains from both Broach and Jalgaon have now reached a stage when they may be said to be 100 per cent. resistant to wilt, and it is expected that within a short time wilt-immune types will be available for distribution in the tracts of Bombay and the neighbouring States affected by the disease.

FIBRES, YARNS, SPINNING, WEAVING, ETC.

220. An Introduction to the Chemistry of Cellulose. By J. T. Marsh and F. C. Wood. (Chapman and Hall, Ltd., London, 1942. Price 28s. Reviewed in *Bull. Imp. Inst.*, xl., **3**, 1942, p. 207.) The first edition of this book was published in 1938, but since that date many further developments have taken place in cellulose chemistry which have been incorporated in this second edition. It is intended as a relatively simple guide to the younger chemists who are entering those branches of industry which are concerned with cellulose, such as the textile industry, paper-making, and rayon manufacture, and admirably meets their requirements. It is essentially a survey of the enormous literature on the subject, the references to which are given in the text as the occasion arises and not in a separate bibliography. The subject matter is dealt with in five parts, covering respectively: the occurrence and general properties of cellulose; its constitution and structure; dispersed cellulose including mercerizing; modified cellulose—*i.e.*, the effects of acids, alkalis and oxidation; and finally the derivatives of cellulose, including the various esters and ethers, as well as rayon manufacture. Every aspect of this important subject is covered in the book, which can be thoroughly recommended as an up-to-date treatise, not only for the young research worker, but, as Sir Kenneth Lee says in his Foreword, for those concerned with industrial production and process control who have no time to read the original literature.

221. Cellulose: Solution in Neutral Salt Solutions. By — Haller. (*Klepzig's Textil-Z.*, **44**, 1941, p. 645. From *Summ. Curr. Lit.*, xxii., **22**, 1942, p. 535.) A sample of cotton was heated in a saturated solution of lithium

chloride; at 80° the fibres assumed a glassy appearance, at 120° the cotton swelled markedly, at 150° it lost its structure, and at 160° lost its cohesion. On cooling, the mass became a crystalline solid. A detailed chemical analysis showed that the cotton had undergone hydrolysis and that lithium chloride is not a solvent for cellulose under these conditions. Cotton was subjected to sodium iodide solution at 130° for 5 hours in a bomb. Weighing the sample before and after this treatment as well as a microscopic analysis showed no change. A sample of cotton extracted with petroleum ether and boiled with lime and alkali was subjected to potassium mercury iodide reagent at low and elevated temperatures; no solution of the cellulose was observed. Cotton was pretreated with fuming nitric acid, acetic acid and caustic soda (36° Bé) for 24 hours, washed free from acid or base and then placed in potassium thiocyanate or potassium mercury iodide reagent at low and elevated temperature; it did not undergo any change. Cotton was pretreated with hydrochloric acid of various concentrations and, without washing, was subjected to potassium thiocyanate, lithium chloride and potassium mercury chloride reagent, respectively; the results were negative, even on heating and boiling. Purified cotton fibre was refluxed for 7 hours with hot saturated solutions of potassium iodide and lithium iodide, respectively. Potassium iodide caused a distinct swelling of the cotton in a relatively short period, whereas lithium iodide required more time to cause the same extent of swelling. There was no indication of any solution of the fibre; the weight losses were 0·3 per cent and 0·5 per cent. in lithium iodide and potassium iodide, respectively. When these tests were repeated with calcium thiocyanate and potassium iodide by heating the cotton and the solution in a metal bomb to 110°, the cotton merely swelled without going into solution or losing any weight. A repetition of the calcium thiocyanate test, in which cotton was heated with an excess of a saturated solution for 5 hours at 120°, yielded a gel-like transparent mass. An analysis of this mass showed that hydrocellulose was formed. The author concludes that aqueous solutions of neutral salts do not dissolve cotton without chemical change. Whenever the cotton actually goes into solution the dissolved product is not unaltered cellulose.

222. Rôle of Velocity Gradient in Determining the Cuprammonium Fluidity of Cellulose. By C. M. Conrad. (*Ind. Eng. Chem.*, Anal. Ed., xiii., **8**, 1941, p. 526. From *Exp. Sta. Rec.*, **86**, 6, 1942, p. 753.) In a study of methods of expressing the results of moderately to highly anomalous solutions, such as 0·5 per cent. cuprammonium solutions of undeteriorated cotton cellulose, the velocity gradient at which the measurement is made was found to be an important factor. The most promising procedure for anomalous solutions consists in obtaining fluidity or viscosity readings at several velocity gradients and then interpolating the results logarithmically to some common mean velocity gradient. Methods for varying the mean velocity gradient are suggested. A mean velocity gradient of 500 $sec.^{-1}$ is recommended as convenient of attainment in ordinary capillary viscometers and probably representative of gradients for which results of anomalous solutions have been recorded. The adoption of a common mean velocity gradient for expression of the results of anomalous solutions will not only eliminate instrument errors but will provide a unique value for any given substance. Methods are suggested for relating this to the molecular weight.

223. Determining the Deterioration of Cellulose caused by Fungi: Improvements in Methods. By G. A. Greathouse *et al.* (*Ind. Eng. Chem.*, Anal. Ed., xiv., **8**, 1942, p. 614. From *Rev. App. Mycol.*, xxii., **2**, 1943, p. 73.) At the Bureau of Home Economics, Department of Agriculture, Washington, D.C., the authors developed a standardized quantitative method for the estima-

tion of fungal decomposition of cellulose, the material selected for the experimental work being bleached, degreased, 8-oz. Army cotton duck, cut into strips and cultured on a liquid medium, the formula for which is given.

Metarrhizium sp. and *Chætomium globosum* were found to cause very rapid decomposition of the material, the loss in breaking strength of the fabric after seven days through the action of these fungi being estimated at 94·9 and 81·5 per cent., respectively. As test organisms for the purpose in view they are superior to *C. elatum*, *Alternaria* sp., *Cladosporium* sp., and *Stachybotrys papyrogena*. The hydrogen-ion concentration of the substratum appears to exert a strong influence on the activity of the cellulose-destroying fungi, all of which, except *Chætomium globosum*, caused a greater loss in breaking strength at *p*H 7 or less.

224. Cellulose Fibres: Structure. By W. Marquette. (*Rayon Text. Mnthly.*, **23**, 1942, p. 518. From *Summ. Curr. Lit.*, xxii., **23**, 1942, p. 566.) The findings of Farr and co-workers and various criticisms and confirmations of these findings are reviewed. The possibility of using the electron microscope for studying the structure of cellulose particles is discussed and it is pointed out that many of the micrographs of cellulosic materials so far recorded with the electron microscope represent ash constituents or some other similarly opaque materials of incinerated fibres rather than the structure of the cellulose itself.

225. Cellulosic Fibres: Action of Light on. (*Text. Wkly.*, **30**, 1942, p. 164. From *J. Text. Inst.*, October, 1942, A453.) When cellulose is exposed to ultra-violet rays for a short time there is, at first, no breakdown of the cellulose with formation of oxycellulose, but polymerization occurs denoted by a decrease in the copper number and an increase in tensile strength of the fibres so treated. Solubility in the usual solvents for cellulose is considerably reduced and esterification is difficult. Illumination of solutions of cellulose derivatives for a short time with ultra-violet rays produces a decrease in viscosity, except in the case of ethyl cellulose. Cotton illuminated by a quartz-mercury lamp of 110 volts at a distance of 15·2 cm. for a period of 0·8 sec. shows an increase in strength of about 20 per cent. If ultra-violet rays are permitted to act for longer periods, breakdown of the cellulose substance occurs with formation of oxycellulose. The effect is not constant for any particular cellulosic fibre, but depends on the surface construction of the latter and on its pre- and after-treatment.

226. Raw Cotton: Analysis for Cellulose. By J. H. Kettering and C. M. Conrad. (*Ind. Eng. Chem.*, Anal. Ed., **14**, 1942, p. 432. From *J. Text. Inst.*, September, 1942, A409.) The raw cotton (10 gm. or less) is extracted with alcohol (Soxhlet, 4 hours) and samples (0·1 gm.) are then digested with 1 per cent. caustic soda (100 c.c.), the residual cellulose is oxidized by acid dichromate, and the unused oxidant is titrated with ferrous ammonium sulphate, using *o*-phenanthroline indicator, over a ground-glass plate beneath which is an electric light. Details are given. In comparative analyses of ten different cottons, the results obtained were slightly higher than by a semimicro-adaptation of the Norman and Jenkins procedure and lower than those obtained by a similar adaptation of the Reid, Nelson and Aronovsky ethanolamine procedure. The proposed method is recommended particularly for the determination of the cellulose content of raw cotton and may be used in analyses of desized fabrics. It is not suitable for cellulose materials which contain lignin.

227. Cotton: Structure and Properties. By R. F. Nickerson. (*Ind. Eng. Chem.*, **34**, 1942, p. 1149. From *Summ. Curr. Lit.*, xxii., **23**, 1942, p. 566.) A general account is given of the structure and properties of the cotton fibre and of the effects of moisture, heat and stresses. Explanations of the behaviour of the fibre in terms of hydrogen bonding between cellulose chains and between internal

fibre surfaces are suggested. Mercerization, crease-resistance, mildewing, and the behaviour of cotton in tyre cord are discussed.

228. FIBRES: EXAMINATION UNDER THE POLARIZING MICROSCOPE. By A. Herzog. (*Textilberichte*, **21**, 1940, p. 97. From *J. Text. Inst.*, October, 1942, A452.) The original German paper describes a complete system for the examination of fibres by means of the polarizing microscope.

229. THE STAPLE LENGTH OF COTTON. By E. Lord. (*J. Text. Inst.*, December, 1942, T205.) The purpose of the work described in this paper is to investigate the relationship between the lengths of staple measured by the American Standards, by practical spinners in this country, and by the sorter diagram method used in the laboratory. The first part of the paper is devoted to a study of 24 samples of cotton, 20 of American Upland type and 4 of American-Egyptian. These form a complete set of the official standards issued by the U.S. Department of Agriculture and cover the whole range of lengths of American cottons. Stapling tests were made on the comb sorter and the nominal lengths of the Standards were compared with the lengths obtained from the sorter diagrams. In the second part of the paper the results of hand stapling tests made by brokers and spinners are compared with those obtained from the sorter diagram.

It is shown that the *Effective Length* is closely related to the nominal staple length of the American Standards. The relationship is not linear, and for all American types the effective length is the larger quantity. Near the extreme end of the scale—that is, for the long American-Egyptian types—the two quantities approach equality. A table is provided so that the effective length can be translated into the corresponding staple length of the Standard. In cases where the highest accuracy is not required, the subtraction of $\frac{3}{32}$ inch from the effective length gives the American staple. The consistent error which may arise by the use of this simple rule will not exceed $\frac{3}{32}$ inch within the range of staples encountered in American Upland cotton. The *Modal Length* would not be expected to agree exactly with the staple length because of the rejection of short fibre that occurs during hand stapling. By suitable transformation of the fibre distribution, chosen to reduce the effect of short fibre, a modified measure of modal tendency has been calculated from the results of the sorter diagrams. This quantity, termed the *Doubly Weighted Mode*, is closely related to the American Staple. For the American Upland types it is always the longer quantity, the excess being about $\frac{1}{32}$ inch for $\frac{3}{4}$ inch staple, increasing to $\frac{3}{32}$ inch for $1\frac{1}{4}$ inch staple. By a construction similar to that used in the determination of effective length, a quantity has been calculated to give a median measure of fibre length in a sorter diagram. This *Modified Median* does not correspond to the actual median length of fibres in the diagram—it is designed to eliminate the effect of short fibre, but it is found to be closely related to the staple length. It is about $\frac{1}{16}$ inch longer than the American Standards for cottons up to a length of about $1\frac{5}{16}$ inch. Other length characteristics of sorter diagrams have been investigated, but these provide less accurate estimates of staple length than those already given. A poor relationship with American staple is obtained if the length characteristic is unduly affected by the presence of a small percentage of excessively long fibre, or by short fibre, quantities that have no appreciable effect on staple length obtained by hand stapling methods. The *Mean Length* is such a characteristic.

The hand stapling experiment described in the second part of the paper was made possible by the co-operation of two brokers and 90 spinning concerns. Over 1,000 samples of cotton were stapled, the different varieties ranging from short Bengals to the longest Sea Island and covering nearly all the main types in general use. In both instances the brokers' results average a little higher than

the American Standards, although the difference is small, three-quarters of $\frac{1}{32}$ inch for Broker A and half of $\frac{1}{32}$ inch for Broker B. For convenience of reference a table is included giving a summary of the average levels of stapling in the three sections of the trade (American, Egyptian and General). The table only gives the general tendency. As pointed out later in the article, the average level of stapling by an individual firm may consistently deviate by as much as $\frac{1}{8}$ inch from the corresponding level of the section of the trade to which it belongs.

In the trade it is recognized that the so-called Liverpool Standards represent staple lengths of $\frac{1}{8}$ inch longer than the corresponding classification based on the American Standards. It follows from the results given above that the average level of classification in the American section of the industry is $\frac{1}{8}$ inch below the Liverpool Standards, that the General section of the trade staple is on an intermediate level, and that the Egyptian section tend to staple on the same baiss as the Liverpool Standards.

230. Cotton Lint: Cleaning. South Texas Cotton Oil Co., Inc., Houston, Texas. (U.S.P. 2,274,385. From *Summ. Curr. Lit.*, xxiii., **1,** 1943, p. 3.) A process for cleaning cotton lint includes successive agitating and tumbling steps over grids, whereby dirt and short fibre are sifted out and retained for further sifting, discharging the clean lint into a stream of air, of sufficient force to carry lint along but to drop the heavier dirt and trash, repeating the process on the clean lint, and blending it into a uniform mixture.

231. Cotton Fabrics: Effect of Desizing, Dyeing and Finishing on Strength. (*Ciba Rev.*, **4,** 1941, p. 1455. From *Summ. Curr. Lit.*, xxii., **11,** 1942, p. 259.) The various chemical and mechanical influences to which printed materials are subjected during processing cause considerable alterations in the mechanical properties of the raw material. Desizing removes certain substances which were introduced into the fibre artificially, and natural substances associated with the cotton fibre are removed during the boiling-out process. Data are given for the mean of five determinations made on dyed material which had been printed with a white discharge. By desizing the tensile strength of the weft is reduced by more than 20 per cent., whilst the warp (the only sized thread in this case) is scarcely altered in its mechanical properties by the removal of the size. The greater loss in tensile strength of the weft is due to the lower degree of twist in the yarn, which has been loosened by this first wet treatment and thus offers less resistance to tension. With a normal loss of substance, boiling-out causes a noticeable increase in warp strength, whilst the weft strength shows a small increase in comparison with the desized weft. In contrast to desizing, dyeing increases the tensile strength of the fabric in warp and weft, probably owing to the addition or absorption of dye leading to an increase in substance of the cloth and a decrease in the length of material due to shrinkage. The effect of the printing process on the tensile strength of the material is similar to that of dyeing. Finishing operations cause considerable increases in tensile strength which, however, are only temporary and disappear when the material is washed. This increase is due to the stiffening of the threads by the added finishing agents, which cause an appreciable addition to the substance of the substrate.

232. Comparison of Fabric Tensile Test Results obtained in Different Laboratories. By B. D. Porritt *et al.* (*J. Text. Inst.*, June, 1942, S9.) Information has been collected on the machines and test conditions used by a number of laboratories in the rubber industry for the tensile testing of fabrics, and on the conditioning treatment given to the specimens. The information obtained is tabulated and briefly discussed. The results are given of tests on samples of the same nine cotton fabrics by eighteen of the laboratories, which were requested to condition the specimens and carry out the tests under specified

and substantially uniform conditions. Data for the breaking load, breaking elongation, and elongation at 200 lb. load of the nine fabrics, which ranged from light sheeting to stout belting duck, are tabulated and discussed. It is shown that with all three properties the variation between different laboratories' results for the same fabric is much greater than could reasonably be ascribed to the variability of the fabric and the random errors of sampling and testing. Thus, among the eighteen laboratories there is a range of variation of about 25 per cent. in breaking load and 50-60 per cent. in breaking elongation and elongation at 200 lb., whereas if all the tests had been made under absolutely the same conditions the variation would have been only about 5-6 per cent. in each case.

233. Cotton Materials: Volumetric Determination of Moisture Content. By J. F. Keating and W. M. Scott. (*Amer. Dyes. Rpt.*, **31**, 1942, p. 308. From *J. Text. Inst.*, October, 1942, A453.) A report is given of a study of the application to the determination of the moisture regain of textiles of the volumetric method which depends on cold extraction with methanol and subsequent titration of the water with Karl Fischer's reagent (a mixture of iodine, sulphur dioxide and pyridine in methanol). Details of the procedure and of the preparation and stability of the reagent are included. Moisture regain values obtained by the oven-drying and titration methods are given for a number of representative cotton fabrics.

234. Mercerizing. By J. T. Marsh. (Chapman and Hall, Ltd., London, 1941. Price 32s. Reviewed *Bull. Imp. Inst.*, xl., **3**, 1942, p. 207.) Nearly 100 years ago Mercer patented his process for the treatment of cotton with caustic soda, and 50 years later Lowe produced the silky lustre of what is now called mercerized cotton by treating the fibre whilst under tension. In the succeeding years more has been written about this aspect of cellulose chemistry than almost any other. Most of this work has been published in the scientific and technical press, and the last complete treatise in English appeared nearly 40 years ago. Mr. Marsh has, therefore, performed a most useful task in compiling the present work, which brings together the results of the latest researches in the subject. After an introduction dealing with the life and work of Mercer and Lowe, the fundamental characters of the cotton hair are discussed, followed by accounts of the mercerizing process and description of the plant used, and of the structure of cellulose and the effects of mercerizing on that structure. Then follows a discussion of the theoretical aspects of the action of alkali on the fibre and of absorptive capacity. The last part is concerned with more practical matters, including tests for the efficiency of the process and a diagnosis of the faults which may arise in the final product. Although naturally in the main concerned with the mercerization of cotton the author also gives an account of the process in relation to rayon and linen. The book is extremely well produced, with an abundance of illustrations, including a number of microphotographs.

235. Mercerized Cotton: Micro-Chemical Testing. By A. V. Surovaya. (*Khlopchato Bumazhnaya Prom.*, **11**, 1939, p. 37. From *Summ. Curr. Lit.*, xxii., **21**, 1942, p. 510.) Moisten with alcohol a bundle of 30-50 threads approximately 15 cm. long, treat with base and dye with Anil Pure Blue FF. Cut the threads to a length of 0·5-0·6 cm., place in glycerol between two object glasses, and count under the microscope the number of mercerized (cylindrical rod) and unmercerized (twisted ribbon) fibres. The coefficient of mercerization is the ratio of the percentage of the mercerized fibres in the factory sample to that in a sample after repeated mercerization.

236. Cotton Neps: Prevention. (*Text. World*, **92**, 8, 1942, p. 99. From *J. Text. Inst.*, November, 1942, A499.) Briefly discusses the respective contributions of carding, weaving and dyeing to the problem of neps in American army twill.

Card settings and speeds are recommended. Perforated tin cloth rollers should be replaced by rubber-covered rollers on the loom. The procedure in dyeing should aim at good penetration.

237. COTTON SPINNING COSTS: DETERMINATION. (*Text. Wkly.*, **30**, 1942, p. 564. From *Summ. Curr. Lit.*, xxii., **24**, 1942, p. 606.) The determination of costs in cotton spinning is discussed, and it is pointed out that in a mill producing a standard count the cost per pound is given by the ratio total costs/dry yarn produced, not by total costs/weight of cotton mixed. In order that the processes may bear their proportionate share of the cost, it is convenient to express the productions in terms of the weight of dry yarn they produce, and to adjust the total cost of producing 1 lb. of dry yarn by the regain percentage. The dry yarn productions are determined by multiplying the actual machine productions by constants. There will be appropriate constants for each particular quality and the constants will vary according to the waste taken out at each process.

238. POST-WAR MODERN COTTON SPINNING. By J. Buckley. (*Text. Mnfr.*, lxix., February, 1943, p. 65.) Part I deals with Modern Cotton Spinning Machines and Methods.

239. TEXTILE FIBRES: MICROSCOPY. By W. Krauss. (*Rayon Text. Mnthly.*, **23**, 1942, p. 599. From *Summ. Curr. Lit.*, xxiii., **1**, 1943, p. 16.) An account of the use of the microscope in (1) the identification of textile fibres, (2) the quantitative analysis of fibres in mixtures, (3) the determination of the quality of fibres, and (4) the identification of damage to the fibres incurred during processing, in storage, or while in the possession of the customer. Specific cases are discussed and photomicrographs of various types of fibres and of fibres damaged by moths, burning, deodorants and silver fish are reproduced.

240. TEXTILE MATERIALS: MOISTURE CONTENT TITRATION. By L. Stanhope. (*Text. Rec.*, **60**, 1942, p. 41. From *Summ. Curr. Lit.*, xxii., **20**, 1942, p. 478.) The use of the Fischer reagent for the determination of moisture is discussed. The preparation of the reagent is described and the method of use recommended by Mitchell for the determination of moisture in fibrous materials such as cotton, paper or regenerated cellulose rayon is outlined. The work of Keating and Scott is discussed and essential features of the potentiometric method of determining the end point proposed by Almy, Griffin and Wilcox are noted.

241. TEXTILE TESTING: PHYSICAL, CHEMICAL AND MICROSCOPICAL. By J. H. Skinkle. (Macmillan and Co., Ltd., London. Chemical Pubg. Co. Inc., New York. 1940. Price 15s. Reviewed *Bull. Imp. Inst.*, xl., **3**, 1942, p. 207.) The author is Assistant Professor of Textile Chemistry, Lowell Textile Institute. The most satisfactory sections are those on the physical testing of fibres, yarns and fabrics and on the chemical tests to be applied to determine the nature of fibres and on damage to cellulose fibres, wool, and silk. These should be very helpful to both manufacturers and consumers. Part III on microscopical testing is too brief to be of much value, occupying less than 12 pages, plus a few tables giving the microscopical appearance of some starches, hairs, bast fibres, artificial fibres, etc. A large number of references to literature are given throughout the book, and there are numerous illustrations, but it is unfortunate that the paper used is unsuitable for the reproduction of half-tone blocks.

242. RESEARCH AIDS: AIR PERMEABILITY INSTRUMENT. (*Text. Res.*, **12**, 7, 1942, p. 20. From *Exp. Sta. Rec.*, **87**, 5, 1942, p. 753.) The improved instrument, described and illustrated, was developed at the National Bureau of Standards by H. F. Schiefer and P. M. Boyland. It permits a determination to be made on any part of a piece of cloth without cutting. Having been found entirely satisfactory in routine use, it is recommended for testing parachute cloth, fabrics

for wind-resistant clothing, blankets, etc. In the test the fabric is held firmly over a very small opening mounted in a table top. Air is drawn, at a rate which may be adjusted, through the fabric into a chamber connected with a horizontal manometer for measuring the pressure drop across the fabric and through an orifice for measuring air flow into a chamber connected with a vertical manometer. The amount of air flowing through a fabric under test is determined from the pressure drop indicated by the vertical manometer and the calibration of the orifice which is used. A set of nine orifices covers the range of air permeability from 1 to 700 cu. ft. per minute per square foot of fabric. The air permeability is usually measured for a pressure drop across the fabric of 0·5 per cent. of water. The appropriate size of the orifice to use for a fabric, the approximate permeability of which is not known, is determined by a trial run. The pressure drop indicated by the vertical manometer should be more than 3 inches. If it is less, a smaller orifice should be used to obtain precision in the instrument.

243. Internal Reorganization of a Cotton Mill. By J. Airey. (*J. Text. Inst.*, December, 1942, p. 124.) The author makes suggestions for improvements in mixing and blowing, carding, draw frame and speed frame, spinning, winding and beaming, conditioning, doubling and twisting, and weaving processes with a view to the redistribution of labour and improving wages and reducing costs. Estimates are given of the savings that could be effected if some of the suggested improvements were adopted.

244. Recruitment, Selection and Training for the Textile Industry. (*J. Text. Inst.*, December, 1942, p. 119.) Reasons are discussed for the shortage of male juvenile labour in the textile industry, and the need is stressed for making conditions and prospects in the industry more attractive. The selection and training of suitable young workers is also dealt with, and better co-operation between industrial and education authorities is advocated. The following is a summary of the recommendations made: (1) The modernizing of premises and the improvement of general working conditions should be encouraged. (2) Post-war arrangements should aim at reducing the sharp fluctuations in prosperity that have marked the industry in the past. (3) The claims of the industry and clear outlines of possible careers in it should be made known in the schools by attractive propaganda. (4) Contacts between the industry and the schools should be established by means of visits to mills by children and educationists and return visits by suitable representatives of the industry to the schools. (5) Teachers in textile areas should be expected to make themselves acquainted with actual conditions in the industry, and to keep industrial applications in mind when framing schemes of study. They should be shown that factory life need not be either inferior or degrading. (6) Recruitment should keep step with educational organization, the outlines of which should be made clear to employers. Arrangements should be made to admit in proper proportions three streams of recruits: (*a*) at the statutory school-leaving age; (*b*) from secondary and junior technical schools at from 16 to 18 years of age; (*c*) from universities and higher technical institutions; and to discriminate between them so that the industry may reap the full advantage of the abilities of each stream. (7) The industry should consider the merits of the junior technical school with a view to the establishment of more schools of this type. (8) More general attention should be given to fitting the youth and the job, whether operative or executive, and to making him understand his place in the industrial organization. (9) The training of the personnel is an industrial responsibility. In this matter the technical institutions are at the service of the industry. It is the duty of the industry to decide upon the elements of the training it requires for each section of its employees and to define the shares in it of the industry

and the technical institution. Trainees should be given proper facilities in the works and for attendance at the technical institution, including time off during the day and adequate recognition of outstanding success. An outline is given of a suggested scheme of training.

245. Cotton Workers: Technical Education. By J. E. Richardson. (*Text. Wkly.*, **30**, 1942, p. 591. From *Summ. Curr. Lit.*, xxii., **24**, 1942, p. 607.) The place of technical education in the educational system and the development and work of technical colleges and junior technical schools are discussed. The needs of the cotton industry are examined and it is pointed out that, although the industry is adequately provided with well-equipped colleges, experienced teachers and reliable examining bodies, there has been a disastrous fall in the number of male entrants to the mills and in the number of students in training. The need for making the industry more attractive to young people is emphasized, and suggestions are made regarding the classification of entrants and schemes of apprenticeship or traineeship. It is recommended that juvenile labour should be regarded as only partly productive and partly as under training. In such a system the junior technical school would play an important part.

TRADE, PRICES, NEW USES.

246. British Cotton Industry: Present Conditions and Post-War Reorganization. (*Times Trade and Eng.*, **52**, 947, 1943, p. 42. From *Summ. Curr. Lit.*, xxiii., **4**, 1943, p. 110.) Reference is made to recent preliminary discussions of post-war organization, and it is pointed out that these have revealed fairly general agreement that some form of control will be necessary, at any rate for a limited period after the war, and that most producers will favour the continuance of some form of controlled prices for both yarn and cloth. Applications for increases in wages in various sections are discussed, and the effects of the latest agreements are explained. It is pointed out that the mills now left open (the nucleus mills) have, during the past year, met with a larger demand, at profitable rates, than they have been able to accept. Almost without exception the mills have not been able to keep the whole of their licensed spindles and looms running full time owing to the scarcity of labour. Government demands are increasing and the utility programme also makes heavy demands, so that not much scope is left for exports.

247. Cotton Industry Organization Now and After the War. (*Text. Mnfr.*, lxviii., November, 1942, p. 425.) Sir Raymond Streat, Chairman of the Cotton Board, in an address given at the Rochdale Rotary Club in October last, outlined the possible scope of post-war control and many items of domestic cotton industry policy. He said his faith was that it was entirely possible, and from a national standpoint vitally necessary, to have a prosperous cotton industry in Lancashire after the war. He believed that as firmly as in victory, but both required sound, well-timed policies, coupled with brave and energetic action. After the war industry will face a changed world, and the first necessity will be to equip ourselves with a new conception of the rôle of industry in the community. The most vital of the foundation stones will be the moral and spiritual convictions chosen. Nevertheless we must adopt objectives also in materialistic terms, and in that realm success for the cotton industry may be defined as trade enough to occupy the mills now running and mills now closed at prices sufficient to make conditions of employment what they should be and profits satisfactory. Home-market demand, including various new uses for cotton, ought to be good, but it will be vital also to national ability to pay for essential imports that cotton should succeed in obtaining a substantial export trade. Doubtless for a short period after the war there will be a great

shortage, and people will buy what is offered, but let us beware of building again any policy and plans on the false impressions created by a scarcity boom. Success will depend on three factors: (1) A sound Government policy for international trade agreements; (2) ability to produce at competitive prices; and (3) a good selling organization.

248. THE COTTON INDUSTRY IN THE RECONSTRUCTION AND POST-WAR PERIOD. By Col. W. A. Grierson. (*J. Text. Inst.*, November, 1942, p. 106.) A report of a lecture given to the Lancashire Section in Manchester in September last. The lecturer stated that the main economic problems of the future are distribution and consumption, and in his view these two interrelated problems can be solved by the setting up of an international organization of product distribution—by balancing supply and demand with the object of achieving total annual disposal of each product, whether agricultural, raw material or industrial. An outline of such an organization was given.

249. COTTON CONTROL: NOW AND POST-WAR. (*Text. Mnfr.*, lxix., January, 1943, p. 5.) In an address to the Oldham Cotton Mill Managers' Association, Sir Frank Platt, the Cotton Controller, explained some inevitable steps in war-time cotton control, and gave personal views on future problems, especially those relating to the cotton-spinning sections. The subject was dealt with under the headings of Raw Cotton; Planned Production; Wages; Post-War Control; Merchants' Future. Sir Frank Platt concluded his address with the following words: "I am not afraid of the future of our great industry. There is a great deal of thought and attention being given to that future by all our friends within and without the trade."

250. COTTON: APPLICATIONS. By D. M. Ellis and E. L. Day. (*U.S. Dpt. Agr., Agr. Econ. Bibliog.*, **91**, 1941. From *Summ. Curr. Lit.*, xxii., **22**, 1942, p. 526.) A selected bibliography of 785 references, in English, during 1933-40 on "Uses for Cotton," classified under 39 headings. The annotations are followed by an index.

251. COTTON GOODS: QUALITY CONTROL. By L. H. C. Tippett. (*Text. Wkly.*, **30**, 1942, p. 622. From *Summ. Curr. Lit.*, xxiii., **1**, 1943, p. 16.) Quality control by means of statistical records, its general advantages, points of possible application in the cotton industry, and the probable effects of such applications are briefly discussed.

252. COTTON TRADE: POST-WAR ECONOMICS. By D. Windel. (*Text. Wkly.*, **31**, 14, 1943, p. 16. From *Summ. Curr. Lit.*, xxiii., **2**, 1943, p. 50.) A report of a lecture reviewing pre-war conditions and making proposals for post-war reconstruction. The proposals include the establishment of an International Central Authority which would (*a*) establish an international currency, (*b*) decide upon a common international language, (*c*) organize the production and distribution of staple primary products in accordance with broad national needs, (*d*) stabilize prices of such products throughout the world in terms of the international currency, (*e*) organize at a later stage the production and distribution of manufactured goods of standard and constant utility, and (*f*) raise living standards in backward countries.

253. COTTON SUPPLY AND MARKETS. By J. A. Todd. (*Text. Mnfr.*, lxviii., 1942. June and subsequent numbers.) This is a continuation of the series of articles commenced in June of last year, giving month by month a review of the cotton situation at home, in the United States, India, Egypt, and South America. The most recent article (March) states that no developments of out-

standing interest took place in the raw cotton section at home during February. The Cotton Control made no releases of raw cotton cargoes for free distribution, but continued its policy of unofficially allocating limited quantities of various growths to designated spinners from the reserve store. Personnel in the Liverpool market has been further depleted by calling-up for war work, and few firms have now more than a skeleton staff. The reduction of 1d. per lb. in price of cottons by the Cotton Control will involve a reduction in the profits derived by the Minister of Supply from importation and distribution. At the present relative level of prices there should still be a moderate profit on imports of Egyptian, Sudan, Belgian Congo and West African cottons. Imports of better-stapled East Indian varieties, however, will involve a loss of about 4d. per lb., and there will be little or no profit on imports of South American cottons.

United States.—Business in the American cotton markets during February remained quiet, but the trend of prices continued upwards, and the highest levels of the war-time movement were reached in the last week of the month. Nearby futures deliveries rose to around 20·50 cents or nearly a cent per lb. over the February parity figure of 19·59 cents. January consumption of all kinds of cotton by the United States mills amounted to 915,000 bales, compared with 948,000 bales in January, 1942. This moderate decline in consumption is due partly to the movement of labour to the Services and better-paid war industries, and partly to temporary stoppages arising out of the strain and stress on machinery. During February the demand for textiles continued in excess of production. Government purchases of cloth for the Services, Lend-Lease, and war aid were substantial, necessitating a further curtailment of offers to the civilian home market. The Secretary for Agriculture has asked farmers to plant up to their full 1943 cotton acreage allotment. It is doubtful, however, whether more than 23,000,000 acres will be planted owing to the shortage of labour and to the tendency to devote more land to soya beans and other food crops.

Egypt.—No Government announcement regarding the 1943 acreage has yet been made, but the opinion is expressed from Alexandria that the area planted will be no larger than in 1942. Exports to Great Britain and the United States have been unimportant, but shipments to India have been resumed on a restricted scale.

India.—The trend of the Bombay market during February continued strongly upward despite domestic political unsettlement. General inflationary influences appeared primarily responsible, though other factors were the keen demand from domestic spinners for all better staple cottons, the record high rate of domestic mill consumption, heavily reduced imports of foreign cottons, and talk of a further big reduction in the 1943 cotton acreage to meet the need for greater production of foodstuffs. Of the prospective 1942-43 cotton crop of around 5,000,000 bales, domestic mills will probably consume about 4,200,000 bales. Exports will possibly be from 300,000 to 400,000 bales, compared with nearly 1,000,000 bales last season. Lack of shipping and the relative dearness of better Indian cottons to other competitive growths are mainly responsible for the poor export prospect.

South America.—The cotton acreage of Argentina is officially estimated at 899,229 acres, against 815,463 acres last season. The area under cotton in South Brazil is estimated to be slightly larger than a year ago. On present prospects a crop of between 1,700,000 and 2,000,000 bales is predicted in São Paulo trade circles. The Peruvian cotton acreage is about the same as the 1941-42 season. Crop prospects to date are satisfactory. No agreement has yet been reached between the Peruvian and United States Governments in regard to buying rates for the coming crop.

MISCELLANEOUS.

254. SKINNER'S COTTON TRADE DIRECTORY OF THE WORLD, 1942-43. (Pubd. annually by Thos. Skinner and Co. (Publishers), Ltd., London, Manchester, Bradford, New York, Montreal.) This is the twentieth edition of this invaluable publication. The efficient compilation of such a directory, difficult and arduous under normal conditions, is infinitely more so in war-time, but in spite of this the customary revision of details has been carried through in so far as has been possible. The revision of details covering enemy and enemy-occupied territories has, of course, not been possible, and these countries have been omitted from this edition. The present conditions of trading, particularly the accepted restriction placed on the export of cotton goods, and perhaps equally so the effect of the " concentration " of industry, has brought into prominence the vital need for keeping before the trade the various trade marks, and a Trade Marks Section has therefore been added to the Directory. The Hosiery and Knit Goods Manufacturers Section is also published again as a separate volume at a nominal price, a feature which is being increasingly appreciated. The thumb-holes for ease of reference are labelled: Contents; Index; Exporters; Merchants; Spinners, Manufacturers and Doublers; Directors (British); Dyers, Finishers; Fabrics; Silk and Rayon; Hosiery and Knit Goods; Hosiery Yarn Spinners, etc.; Textile Trade Marks; Mill Supplies. All headings, indices and explanatory notes are printed in English, French, German, Italian, Spanish and Portuguese. The Directory is absolutely indispensable to all those concerned in any way with the cotton industry. The price by post, inland and abroad, is £1; Canada and United States, $7 (post and duty free).

ADDENDA.

255. MEMOIRS OF THE COTTON RESEARCH STATION, TRINIDAD. (Pubd. by the Empire Cotton Growing Corporation. Price 2s. 6d.) The nineteenth number of Series A, Genetics will be published shortly, and will contain the following paper reprinted from the *Journal of Genetics*:

Colchicine Produced Polyploids in Gossypium. I. An Autotetraploid Asiatic Cotton and Certain of its Hybrids with Wild Diploid Species. S. G. Stephens. Meiotic studies of a colchicine-produced tetraploid, *Gossypium arboreum* var. *neglectum* ($4n=52$), gave further support to the hypothesis that diploid *Gossypium* species are secondary polyploids. Female gametes of the tetraploid were 40-50 per cent. fertile. This figure is in agreement with the expected fertility of the male gametes as calculated from the proportion of 26 chromosome plates found at metaphase 2. Pollen fertility, however, was considerably lower than this owing to the failure of germination or slow pollen-tube growth of many apparently viable grains. The tetraploid is therefore partially male sterile. The tetraploid when used as female parent crossed readily with several wild diploid and New World ($n=26$) species. Their compatibility relations are discussed. In estimating compatibility it was found that only the percentage viability of fertilized ovules was affected by the male parent; variation in percentage of ovules fertilized may well have been due to chance. Studies of metaphase 1 in the triploid hybrids, tetraploid × *G. armourianum*, tetraploid × *G. raimondii* and tetraploid × *G. sturtii*, showed that on the average less than one trivalent was formed per pollen mother cell. Homologies between Asiatic and wild diploid species are therefore very low. Furthermore, there was evidence that *sturtii* chromosomes are not closely homologous with either Asiatic or American diploid chromosomes. The uses of induced polyploidy in cotton-breeding programmes are discussed. Its value is shown to be greatly restricted by the secondary polyploidy existing in all species of *Gossypium*.

256. Memoirs of the Cotton Research Station, Trinidad. (Pubd. by the Empire Cotton Growing Corporation. Price 2s. 6d.) The fifteenth number of Series B, Physiology, has recently been published, and contains the following papers reprinted from the *Annals of Botany*:

On Diurnal Variations in the Mineral Content of the Leaf of the Cotton Plant. E. Phillis and T. G. Mason. Samples of leaves were collected at 6-hour intervals over a period of 96 hours, and their dry weights, water, and mineral contents determined, results being expressed on the sample basis. There were well-marked diurnal changes in all these values. The results are in harmony with the view that the mineral elements enter the leaf in the wood and, with the exception of calcium, are exported from it in the phlœm. The interpretation of the results is complicated by losses of mineral elements caused by dew.

Studies on Foliar Hydration in the Cotton Plant. I. The Effects of Potassium Supply and Size of Plant. T. G. Mason and E. Phillis. The published data on the relation between potassium supply and leaf hydration are stated to be contradictory, some investigators having found a positive correlation and others a negative one. It was found that an increase in potassium supply to plants growing in pots filled with sand led to a reduction in hydration and an increase in size of plant (size and hydration being negatively correlated), while with plants growing in the open in soil an increase in potassium supply led to increases in both hydration and size (size and hydration being positively correlated). To explain this difference in the effect of increased potassium supply on hydration in pots and in the field it is suggested that in pots an increase in size caused a reduction in hydration owing to the inadequate water-supplying power of the pots, while in the field an increase in size imposed no such stringent limitations on the water supply to the roots. To test this suggestion plants were grown in pots filled with sand under short daylight to ease the water strain, and it was found that under these conditions increased potassium supply was associated with increased size and increased hydration, while with controls growing under normal daylight increased size was associated with decreased hydration.

II. Preliminary Observations using the Disc Culture Method. T. G. Mason and E. Phillis. Discs punched from leaves were floated on water and salt solutions in daylight. It was found that the discs floating on salt solutions may show very large increases in water content (about 170 per cent. in 13 days) and that discs floating on water may lose water (about 20 per cent. in 13 days). This water uptake by discs took place both on a full nutrient solution and on solutions of $CaCl_2$. An estimate of the electrolyte concentration in the sap was obtained from conductivity measurements, while an estimate of total solute concentrations was obtained from freezing-point determinations. It was found that water uptake might take place without any change, and even with a decline, in conductivity and in freezing-point depression. Salt content (conductivity $\times$ water), on the other hand, showed a very close relationship with water uptake. It is suggested that salt increases the hydration capacity of the leaf proteins in the same way that the hydration capacity of gelatine is increased by salts in its iso-electric region. It is also pointed out that salt might affect respiration and that this might in some way influence the hydration capacity of protoplasm.

Studies on the Partition of the Mineral Elements in the Cotton Plant. III. Mainly Concerning Nitrogen. E. Phillis and T. G. Mason. The problem of protein regulation in the leaf is considered. In the first experiment it is shown that discs punched from leaves and floated on a nutrient solution containing inorganic nitrogen can form protein as readily as intact leaves. It is concluded that the synthesis of protein is determined by factors in the leaf and is independent of any factor exerted by the rest of the plant. In four subsequent experiments covering a wide range of conditions it is shown that the protein-N level (protein-

N per 100 gm. dry weight) is largely determined by the crystalloid-N level (crystalloid-N per 100 gm. dry weight). As the level of crystalloid-N is increased there is a rise in the protein-N level which reaches a maximum. After this, a further rise in the crystalloid-N level causes a decline in the protein-N level. It is pointed out that this type of relation is characteristic of apolar adsorption. Examination of rather limited data on the relation between polysaccharides and total sugars, and between insoluble and soluble phosphorus, suggests that adsorption may also play an important part in determining the levels of polysaccharide and insoluble phosphorus respectively.

PERSONAL NOTES.

Dr. J. C. Willis, F.R.S.—Readers of the Empire Cotton Growing Review in its peace-time form will join with the Corporation in heartiest congratulations to Dr. J. C. Willis, who celebrated his seventy-fifth birthday on February 20 of this year. Dr. Willis was Editor of the Review from its first publication in January, 1924, until his retirement in October, 1939, and during those sixteen years he achieved a high degree of success in conveying through the medium of the Review information to the scientific reader on subjects necessarily technical, without, however, repelling the non-technical reader, since he also found much in its pages of interest and value. Marooned in Switzerland by the war, Dr. Willis is still working with his characteristic industry on botanical problems, and we learn with much interest that we may expect, when conditions are more propitious, a further contribution to his work on plant dispersal in the form of a study on geographical distribution.

Sir Edwin Butler, C.M.G., C.I.E., F.R.S.—We record with deep regret the death on April 4 of Sir Edwin Butler, who for more than twenty years had rendered most highly valued service to the Corporation as adviser on the organization of research and in his own special field of plant pathology. As Dr. Butler, he was a member of the Corporation's Research Committee when it was first formed in 1922. When the Committee was reconstituted in 1937 he was again appointed, and continued to serve up to the time of his death. He was appointed by the Sudan Government in 1927 to be a member of the London Advisory Committee on Agricultural Research in the Sudan, under the chairmanship first of Sir James Currie and later of Sir Richard Jackson. He paid a visit to the Sudan, mainly to advise on the control of blackarm disease, in 1931. Dr. Butler's distinguished career as Imperial Mycologist in India and in charge of the Agricultural Research Institute at Pusa was followed on his return to England by his outstandingly successful organization of the Imperial Bureau of Mycology, of which he was the first Director, and still later by his tenure of the secretaryship of the Agricultural Research Council. This accumulated experience gave a weight to his views which was only equalled by his modesty in their expression.

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ABSTRACTS OF CURRENT LITERATURE

COTTON IN INDIA.

257. INDIAN COTTON: STATISTICS. We have received from the Indian Central Cotton Committee copies of Statistical Leaflets Nos. 2, 3 and 4, 1941-42, giving information regarding the following: Stocks of Indian raw cotton held in India by the mills and the trade on August 31, 1942; receipts at mills in India of raw cotton classified by varieties; approximate distribution by staple length of Indian cotton received at mills; exports by sea of Indian raw cotton classified by varieties; distribution by staple length of Indian cotton exported by sea, 1941-42 season.

258. FUTURES TRADING AND FUTURES MARKETS IN COTTON, WITH SPECIAL REFERENCE TO INDIA. By H. L. Dholakiâ. (New Book Co., 188-90, Hornby Road, Bombay. 1942. Price Rs. 10.) The growth of Futures Markets in various commodities is an important development in modern business, and the Futures Market in cotton is the most important one in India. Though large numbers of people are daily engaged in this business, there has been no authoritative source of information regarding the actual working of the Market, nor has the economic significance of its transactions been fully realized by the public, although the Futures Market plays a very important rôle in the fixing of prices, the allocation and distribution of risk, and in the levelling up of seasonal and other fluctuations. The present volume is the first systematic attempt made in India to fill this gap, and a great amount of work has been involved in its preparation. Beginning with a brief history of the futures trading in cotton, the author proceeds to analyse the nature of a futures contract, bringing out its full implications. The organization of a Futures Market in cotton is discussed with particular reference to the East India Cotton Association. The main issues regarding the problem of regulation of these markets are explained and concrete suggestions made to indicate the lines of reform, together with useful comparisons with similar markets in other countries. Whilst it may not be claimed that the treatise deals with the question in a completely exhaustive manner, it will be recognized that every effort has been made by the author to marshal facts and figures available to him in an impartial spirit. There are several points on which differences of opinion exist in the trade itself on some of the subjects dealt with, but the author has endeavoured to present both sides in an able manner. The volume should supply a long-felt want in the cotton trade in India, and enable all, including the public at large, to follow intelligently the various questions discussed. Among the important subjects treated in detail are the following: Hedging, Speculation, Prices, Parity Differences, Badla (Straddle) Operations, Options, Regulation of Futures Trading and Markets, the Problem of Unity of Control. The volume is furnished with a useful index.

259. INDIAN CENTRAL COTTON COMMITTEE. At the meeting of the Committee held at the end of January last the main item of discussion was the limiting of the area

under short-staple cotton, and maintaining and, if possible increasing, the area under food crops. Last season the area under short-staple cotton in India was reduced by 4,000,000 acres, and the area in the *kharif* season under food grains was increased by 8,000,000 acres. This substantial result was achieved by the Government mainly as the result of propaganda—it being pointed out to the grower that short-staple cotton was now being produced in excess in India and that food grains were an urgent necessity for the country. Unfortunately, short-staple cotton has proved a more paying crop to the grower than food. In the Punjab, for example, the grower received Rs. 73 per acre for short-staple cotton against Rs. 40 per acre for millets. Recommendations made for submission to the Government of India were that, if necessary, the area under short-staple cotton should be restricted compulsorily; that the farmer should be given inducements to grow food crops by the guarantee of a fair minimum price in advance at sowing time, by the supply of seed at cheap rates, the reduction of revenue, etc., and the removal or adjustment of the existing maximum prices for food grains. It was also recommended that a Central Crop Planning Board be established by the Government of India to work in co-operation with the Central Food Advisory Council.

260. CULTIVATION OF SHORT-STAPLE COTTON DISCOURAGED. (*Cotton*, M/c, 17/4/43.) It is stated from Bombay that the Indian Central Cotton Committee has recommended to the Central Government that since there was no scope for profitable cultivation of short-staple cottons during the war period, they should pursue the policy of discouraging increased cultivation of short-staple varieties, and it appears unlikely, therefore, that there will be any increase in acreage under these cottons during the coming season.

261. SPINNING TEST REPORTS ON INDIAN COTTONS, 1941-43. By N. Ahmad. (*Tech. Circs.* Nos. 530-537. Ind. Cent. Cott. Comm.) The circulars contain the grader's report and spinning test results for 289F, Surat 1027ALF, Bailhongal Jayawant, Gaorani 6, P.A. Multan 289F, 43F/P.A. 289F, P.A. 289F/K25 cottons compared in each case with A. R. Kampala cottons, for the 1941-42 season, and the report of the Standards Committee and spinning test results for Sind Sudhar cotton for the 1942-43 season.

262. TECHNOLOGICAL REPORTS ON STANDARD INDIAN COTTONS, 1942. By N. Ahmad. (*Tech. Bull. Ser. A*, No. 56, 1942. Ind. Cent. Cott. Comm.) As in former years, the agricultural details, grader's report, fibre particulars, spinning tests and remarks are given for each of the twenty cottons tested. Seven cottons showed a definite improvement over last season, ten gave practically the same performance, while three cottons showed a falling-off. Improvement is most marked in Gadag I (Bombay), LSS (Punjab), Late Verum (Nagpur), Umri Bani and Gaorani 6 (Hyderabad), Cambodia and Karunganni (Madras), and is not confined to any one area but is fairly widespread over the country. Little change was shown by Jayawant, Wagad, P.A.4F, 289F/K25, Mollisoni, V.434 (Akola), Sind N.R., Hagari, Nandyal, and Koilpatti, but there was a definite falling-off in performance by Surat 1027 ALF, Jarila, and Sind Sudhar.

263. TECHNOLOGICAL REPORTS ON TRADE VARIETIES OF INDIAN COTTONS, 1942. By N. Ahmad. (*Tech. Bull. Ser. A*, No. 55, 1942. Ind. Cent. Cott. Comm.) The valuation reports of the Standards Committee and of the Special Appeal Committee and spinning test results for the 1941-42 season are given for 24 varieties of cotton supplied by the East India Cotton Association, the grader's report and spinning test results for seven cottons supplied by the Bombay Millowners' Association, four by the Ahmedabad Millowners' Association, and three by the Southern India Millowners' Association.

264. SCIENTIFIC REPORTS OF THE IMPERIAL AGRICULTURAL RESEARCH INSTITUTE, NEW DELHI, 1940-41. (Manager of Pubns., Delhi, 1942. Price Rs. 1.8 or 2s. 3d.) A report of progress in the research work carried out during the season in the different branches of agricultural science.

265. BENGAL: WORK ON COTTON. By N. Deb. (*Ind. Frmg.*, February, 1943, p. 98.) The trial of long-staple cotton is continuing at six centres in the Province. Last season the Dacca Parbhani variety made progress in all centres, and gave an outturn

varying from 10-12 maunds of seed cotton per acre. Work on short-staple cotton, financed entirely by the Indian Central Cotton Committee, is being continued at Rangamati in the Chittagong Hills tracts.

266. BOMBAY: A NEW COTTON FOR BROACH. (*Ind. Frmg.*, iv., **1**, 1943, p. 37.) Efforts in the past to select high-yielding and better-quality strains of Broach *desi* cotton resulted in the isolation of three strains, of which Broach *desi* 8 was found the most successful, combining a high degree of wilt-resistance with excellent fibre qualities ($\frac{7}{8}$-inch staple capable of spinning 30's warp counts). Ginning outturn, however, was low (32 per cent. compared with 40 per cent. of the local Goghari mixture), and further breeding work was financed by the Indian Central Cotton Committee to overcome this drawback. Attempts to isolate a suitable strain from the local Broach cotton had to be abandoned owing to the lack of suitable material and hybridization had to be resorted to. BD.8 was crossed with several high-ginning Goghari strains and types superior to Goghari in fibre qualities, and Segregates 1-2 and 1-6 were found promising. Besides being highly resistant to wilt they have a ginning outturn of about 40 per cent. and fibre length of over 21 mm., and are capable of spinning 45's and 41's highest standard warp counts, respectively. Their yield is significantly higher by 27 to 37 per cent. than that of the quality strain BD.8, but 10 to 16 per cent. less than that of Broach local. On the basis of mill valuation, the Segregates realized Rs. 7 more per acre than BD.8 and Rs. 20 more than Broach local. The testing of the Segregates under optimum conditions of wilt-infection has confirmed their high degree of resistance. To obtain improvement in fibre length and feel, they have been crossed with 1027ALF, and the results are being awaited with interest.

267. MARKETING OF PURE JARILA COTTON. (*Cotton*, M/c, 28/8/43.) Describes a scheme sanctioned by the Government of Bombay for the organization of co-operative cotton sale societies for the marketing of pure Jarila cotton in the West Khandesh and Nasik Districts, and the "Agmarking" of pure Jarila cotton produced by members of the co-operative societies and other approved cultivators. The estimated cost of the scheme, over a two-year period, is Rs. 17,920. The Government of Bombay has declared its intention of prohibiting the cultivation of any variety of cotton other than Jarila in East Khandesh District.

268. STUDIES ON THE QUALITY OF JAYAWANT COTTON GROWN FROM SEEDS OBTAINED FROM DIFFERENT STAGES OF PROPAGATION. By H. R. Nayak. (*Ind. J. Agr. Sci.*, xii., **6**, 1942, p. 865.) Jayawant cotton grown on the Dharwar Farm from seeds obtained from six stages of propagation was examined for fibre and agronomic characters during the 1938-39 and 1939-40 seasons. There was no evidence of deterioration in fibre length, fibre maturity and maturity ratio, but there was a tendency for the cotton to become coarser, to give lower ginning percentage, lower lint index, and lesser number of hairs per seed during the later stages of propagation.

269. MADRAS: MUNGARI COTTON. (*Ind. Frmg.*, iii., **12**, 1942, p. 645.) On the black soils of Anantapur, Bellary and Kurnool districts of the Madras Province cottons commercially known as "Westerns" and "Northerns" are grown; they are medium-staple varieties, capable of spinning 24's to 32's. The type of cotton grown on the red and light black soils, on the other hand, is that known as Mungari, which is a coarse short-staple variety similar to Bengals, and only spinning 8's to 10's. The yield and ginning percentage of Mungari are, however, much higher than those of the Westerns and Northerns. The coexistence of these widely different strains in the same tract favours undesirable mixing and hampers the spread of improved strains like H1 and N14 evolved in the Westerns and Northerns cottons respectively. To overcome this difficulty the Indian Central Cotton Committee has sanctioned a scheme for the tract to evolve types of cotton suitable for red soils and combining the quality of the Westerns with the yield of Mungari, to replace the inferior Mungari. Experimental trials have shown that none of the strains of Asiatic and American species imported from Central Provinces, Bombay, Hyderabad and Coimbatore give better yields than the local type, and, further, that strains H1 and N14 are unsuitable for growing on red soils. A comparison of the results of trials during the past four seasons has

shown that Co.4 is more suited to light black soils, while V434 is more consistent in behaviour, especially on red soils. The more promising selections from Mungari and other varieties have been tested against the local, but have been found later maturing than the control. Accordingly, crosses have been made between the desirable selections and the early maturing varieties like V434, and the hybrids are now in the first and second generations.

The problem of the control of the small leaf disease is of great importance to the tract, and the Committee is financing its investigation at Poona by Dr. B. N. Uppal, Plant Pathologist to the Government of Bombay. The testing of *arboreum* and *herbaceum* cottons with the object of isolating a type resistant to the small leaf disease will constitute an important item in the future programme of work. It is intended also to start concurrently the breeding of early thrips-resistant strains of American cottons. Considerable damage is caused to the cotton crop in the early stages of growth in the tract by the red hairy caterpillar, and experimental plots have had to be discarded in the past on account of the havoc caused by this pest. Cucumbers were tried as a trap crop, and these were found to be preferred by the caterpillars to cotton; experiments are now in progress to determine the method of using this crop for controlling the pest.

270. PUNJAB: SUSCEPTIBILITY OF AMERICAN COTTONS TO JASSID. By M. A. Khan. (*Ind. Frmg.*, February, 1943, p. 101.) Jassid is one of the major pests attacking Punjab-American cottons, and in years of abundant rainfall in the summer causes considerable losses. The work of evolving varieties entirely immune to the pest, or which possess a high degree of toleration to it, is in progress in Lyallpur in the Cotton Research Botanist's section. The existing Punjab-American varieties are being crossed with types reputed to be jassid-resistant, such as Tanguis and Cambodia. The crosses with Tanguis have shown a high degree of resistance in the initial stages, but later this resistance has gradually been reduced. The crosses with Cambodia, however, have yielded very promising progenies which have not only maintained resistance throughout, but have also given new types which possess superior fibre. It is hoped that the problem of jassid resistance in the Punjab may be successfully solved by these Cambodia crosses.

COTTON IN THE EMPIRE (EXCLUDING INDIA).

271. BRITISH COTTON GROWING ASSOCIATION. The thirty-eighth Annual Report to December 31, 1942, states that while war conditions have presented many and varied problems to Empire cotton-growing countries, such as the difficulties of obtaining supplies, the necessity of growing more food crops, and the problem of shipping, there is every evidence that the industry has been well established and the decline in the total quantity of cotton grown in the Empire was in the main due to adverse weather conditions. The work of the B.C.G.A. (Punjab), Ltd., was continued: 21,400 acres were under cotton and gave an average yield of 648 lb. seed cotton per acre. Twelve ginning factories were in operation, and the total turnover was 17,600 bales. As to the cotton crops of the Colonies, the Sudan total is less than last year, but a large crop of high quality is still produced, which is a valuable contribution to the war effort. Uganda, Tanganyika, and Nigeria also produced less than last season, mainly due to unfavourable weather. These smaller crops are not surprising since at all times, and particularly in seasons of adverse weather conditions, the growing of food crops rightly receives the first consideration. An exception to the smaller crops was Nyasaland, where production was nearly four times larger than the previous season. The total world production for 1941-42 was returned at 26,200,642 bales. Whilst many countries, which before the war were large exporters of cotton, are carrying substantial stocks for which no export outlets can be arranged, it is gratifying to record that on the whole shipping space has been provided for Empire crops.

272. THE STORY OF THE IMPERIAL INSTITUTE. By Sir Harry Lindsay. (*Bull. Imp. Inst.*, xli., 1, 1943, p. 11.) In the special number of the *Bulletin* commemorating the Jubilee of the Imperial Institute (founded in May, 1893), the present Director

has written a very interesting account of the history of the Institute and of the valuable work that has been carried out there during these years.

273. British Honduras: Cotton Crop, 1943. (*Crown Col.*, June, 1943, p. 450.) The 1943 crop of the newly developed Sea Island cotton industry of British Honduras is to be purchased by the Ministry of Supply at a price of 24d. per lb., f.o.b.

274. ASIA. Ceylon: Cotton Industry, 1941. (*Admin. Rpt. of Act. Dir. Agr.*, 1941. Received 1943.) The year was a better one for cotton than 1940. The sales to the Wellawatta Spinning and Weaving Mills, under the Cotton Purchase Scheme, amounted to 4,299 cwts. seed cotton at a cost of Rs. 47,124, compared with 2,315 cwts. at a cost of Rs. 24,259 in 1940. By arrangement with the Company the rate of payment for seed cotton delivered in Colombo was raised from Rs. 12.00 to Rs. 12.50 per cwt. The seed supplied free to growers was, as usual, the established Cambodia variety.

In connection with varietal trials, some of the imported strains showed promise in their first season's growth at Tissa, particularly two hybrids between U.4/4 and Cambodia. Individual plant selections were made from each variety, and the work is being continued.

275. Cyprus: Cotton Industry, 1940-41. A note from the Dept. of Agriculture, received in May, 1943, stated that owing to the extension in the area under food crops there was a decrease in the acreage planted to cotton, and, in addition, adverse climatic conditions caused a reduction in yield. There was an improvement in the quality of Cyprus cotton owing to the increase in cultivation of the American variety Coker 100.

276. Shortage of Fertilizer. (*Ann Rpt. Dir. Agr.*, 1941.) In view of the shortage of imported fertilizers and in order to supplement the generally poor supplies of organic fertilizers, the Department of Agriculture took over large dumps of the accumulated refuse from Nicosia town, and after removal of tins, bottles, stones and other non-decomposable matter, it was converted into "town refuse compost," which was offered to farmers within a reasonable distance of the dumps at a cheap rate below the cost of production. The demand at first was very slow, but towards the end of the year it increased considerably, and nearly 2,000 tons were sold in the last two or three months.

277. AFRICA. East Africa: Cotton Crop Purchases. (*Crown Colonist*, May, 1943, p. 363.) The British Government has agreed to buy the East African cotton crop until the end of the war at a guaranteed price.

278. Nigeria: Cotton Industry, 1941-42. (*Ann. Rpt. Emp. Cott. Grwg. Corpn.*, 1941-42.) The output of cotton was less than half that of the previous season, which was a record export crop for the Protectorate. This was mainly due to a decision on the part of the Government at home that cotton-growing should be restricted to an export of some 4,000 tons (22,400 bales). The price was accordingly reduced at the ginneries, and it was announced that buying stations would not be opened in outlying areas. Propaganda in favour of early sowing and careful cultivation was also discontinued. Later on in the season, the policy was changed, and the country was asked to increase its output. Such steps as were possible were taken to secure this increase, but the weather of the latter part of the season proved unfavourable. Moreover, on account of the increased cost and comparative shortage of imported cotton goods, there was a boom in the local spinning and weaving industries, and cotton consequently found a ready sale in the native markets at prices which rendered the export price offered insufficiently attractive.

In the Southern Province the weather was favourable and the crop produced was considerably larger than that of the previous season, and of good quality.

As regards experimental work, little more than routine maintenance of the best strains and their multiplication was attempted, together with some mass selection in the ordinary crop grown in the Northern Provinces. Further progress was made in the South in the selection of improved strains of Ishan cotton.

279. Cotton Industry, 1942-43. (*Half-yrly. Rpt to March* 31, 1943.) *Northern Provinces.* Weather conditions during the growing season were responsible for a low

yield in many areas. The crop contained an increased proportion of immature cotton, but on the other hand the comparative dryness of the growing season resulted in less damage than usual from insect pests, and there was a reduction in the proportion of Grade II. As in the previous season several markets in outlying districts remained closed with a view to conserving petrol and tyres and the necessity of releasing cotton for the local weaving trade on account of the shortage of imported piece-goods. The British Cotton Growing Association again acted as Agents for H.M. Government for the purchase of cotton at the ginneries. The price paid was 1·4d. per lb. for Grade I seed cotton, compared with 1·0d. per lb. in 1941-42. For the third season the Produce Inspection Division was responsible for the inspection and supervision of cotton markets in the main belt. Regulations were rigidly enforced. In all markets demonstrations were given on the correct methods of sewing and sealing of bags. The proportion of Grade II cotton was 5·7 per cent. of the total crop purchased as compared with 5·5 per cent. in the previous season. 5,969 tons of seed have been provisionally reserved for planting in 1943, against 5,390 tons actually distributed in 1942. The Ministry of Supply have asked for a planned output of 45,000 bales, and if conditions are favourable this figure should be reached, but the production of groundnuts is of first importance, and to avoid undue competition in the groundnut areas cotton production for export will be limited to Zaria Province, Southern Katsina, and Sokoto and Kontagora Divisions of Niger Province, and no markets will be opened outside these areas.

The distribution of the Department's special seed in the Awai district of Zaria Province is giving good results. It has a higher ginning outturn than ordinary Allen, and a consignment shipped from the 1941-42 crop received the following favourable report: "Staple definitely longer and smoother than the average NAI cotton. Spinning satisfactory."

Southern Provinces.—Owing to unsatisfactory rains at planting time the 1942-43 cotton crop was not as good as last year in some areas. Cotton markets were opened in February, the grading being taken over by the Produce Branch of the Department owing to the Cotton Examiners of the Ibadan N.A. being occupied with food production work in Oyo Province. In all 18 cotton markets functioned during the season. The crop is estimated at about 4,500 bales. Applications for cotton seed are already being made for the 1943-44 season from the new cotton areas of Ondo Province, and it appears likely that cotton will be grown on a much wider scale in those areas.

280. Daudawa Cotton Seed Farm. A report of the activities at Daudawa during the period April 1, 1942 to March 31, 1943, states that the grant by the Corporation towards the maintenance of Daudawa Farm was continued. It was not possible to keep within this allocation owing to additional wartime activities and other responsibilities, and funds were provided by Government to meet the extra expenditure. Owing to the ravages of termites the cost of maintenance and of repairs to existing semi-permanent buildings was very high. Extensions to roads and repairs to existing roads were carried out, and anti-erosion terraces were repaired. During the season 473 acres were planted to cotton, 150 at Daudawa Farm, and 313 on Unit and Mixed Farms, the total yield being 97,259 lb. seed cotton. The multiplication of cotton seed continues to be of major importance at Daudawa, but with the posting of a second Agricultural Officer to the station the production of bacon pigs, potato growing, mixed farming, and cattle fattening have been undertaken. In addition to this work the Daudawa Settlement Scheme has been extended, and at the moment farms are available for 50 settlers, the total acreage given up to them being 768 acres. Eight new holdings were established during the year.

281. An Experiment in Land Settlement. By C. B. Taylor. (*Trop. Agr.*, April, 1943, p. 71.) An interesting account of the work in connection with cotton seed improvement, the land settlement scheme, and the introduction of cattle cultivation and animal husbandry, etc., carried out up to date at the Daudawa Seed Farm established by the Empire Cotton Growing Corporation in the Katsina Emirate, Nigeria, in 1924, and handed over to the Nigerian Government by the Corporation in 1941. [*Cf.* Vol. VII., p. 279, and Vol. XIII., pp. 12, 297, of this Review.]

282. NYASALAND: COTTON INDUSTRY, 1941-42. (*Ann. Rpt. Emp. Cotton. Grwg. Corpn.*, 1941-42. Issued 1943.) The cotton crop was considerably more than double that of the preceding year, the greater part of the increase being produced in the Lower River area. Larger crops were, however, reported from all the principal cotton-growing districts. The chief problem in the Lower River district is the control of red bollworm, and in order to continue their work on this serious pest more effectively the two entomologists on the Corporation's staff have moved from the Domira Bay Station: Mr. Pearson is at Zomba, where the Agricultural Department have kindly supplied him with the special laboratory accommodation that his work requires, and Mr. Mitchell is at Limbe, which is nearer the Lower River. Both entomologists are devoting their whole time to those insect pest investigations which are of special importance in that area. In the Central area, which is potentially the largest cotton-producing part of the country, the African agricultural system is one of shifting cultivation and bush fallowing, and as there is adequate land, it is unlikely that there will be any change for many years. The Experiment Station at Domira Bay is meanwhile endeavouring to settle what is the best way in which African practice can be systematized by incorporating a combination of long-term crops and bush fallowing as a means of conserving soil fertility. Cotton-breeding work continues. The present variety, which is derived from U.4, gives good yields in all districts, but work is being directed towards the possibility of improving its quality somewhat without sacrifice of its excellent agricultural properties.

283. COTTON INDUSTRY, 1942-43. The latest report from the Dept. of Agriculture is to the effect that in the Northern Province (excluding North Nyasa) the crop is clean and promising, and a heavier yield than in 1942 is anticipated. In the Southern Province, Lower River Districts, a heavy attack of jassid has developed and locust hoppers have caused damage to a number of gardens. In the Southern Province, excluding Lower River Districts, early growth and development has been good but locust damage has occurred in many localities.

284. COTTON CROP PURCHASE. (*Crown Col.*, September, 1943, p. 666.) The utmost satisfaction is expressed at the announcement that the British Government will purchase the entire cotton crop this season and each season until the end of the war, and for one complete season thereafter. The price, averaging 1½d., is satisfactory to native growers and to ginners, who receive a quota of the crop for ginning. The *Nyasaland Times* commends this, saying that African-produced crops require not high but stabilized prices.

285. NORTHERN RHODESIA: COTTON INDUSTRY, 1941-42. (*Ann. Rpt. Emp. Cott. Grwg. Corpn.*, 1941-42.) Cotton growing was confined to one part of the Luangwa Valley: some outlying areas had to be dropped on account of an outbreak of sleeping sickness, and there was consequently a reduction in the number of cultivators. The season was, however, exceptionally favourable, the average yield obtained being about 600 lb. seed cotton per acre.

286. SOUTHERN RHODESIA: COTTON MILLS. (*E. Afr. and Rhod.*, 15/7/43, p. 783.) The first cotton mills to be erected in British East or Central Africa were opened at Gatooma, Southern Rhodesia, on July 3, by the Governor of the Colony, Sir Evelyn Baring. The mills, established by the Southern Rhodesian Government, are being operated by the Cotton Research and Industry Board under the chairmanship of Major G. S. Cameron, who recalled that for eighteen years the Empire Cotton Growing Corporation (of which he is local representative) had run a cotton-breeding establishment and had evolved a jassid-resisting strain which had made the cotton industry a practical proposition in Rhodesia. The Minister of Finance, Mr. Max Danziger, stated that the industry offered a good example of dovetailing Government and private enterprise. Farmers grew the cotton, while the Government graded and ginned it, paid the growers a guaranteed price, and then handed the processed material to private enterprise for manufacture into blankets, cloth, and other articles.

287. SOUTH AFRICA: COTTON INDUSTRY, 1941-43. (*Ann. Rpt. Emp. Cott. Grwg. Corpn.*, 1941-42.) In the 1941-42 season there was no effective rain during the

seven months mid-April to the end of November, and ploughing could not be started, therefore, until it was already late for planting cotton. As a result the acreage was smaller and the crops were also below average. There was some disappointment with the price realized, 8¼d. per lb., which was considered low in comparison with prices of other farm crops. The whole crop was absorbed in the Union itself, whereas previously most of it had been exported. The acreage planted in 1942-43 was again very small, owing chiefly to the low price received by growers for cotton as compared with cereals and leguminous crops. At the Barberton Experiment Station prospects for a satisfactory season's work are good despite heavy rains which caused damage to late plantings.

288. WORK OF THE EXPERIMENT STATIONS, 1941-42. (*Prog. Rpts. of Exp. Stats.*, 1941-42.) The cotton crop on the Barberton Station was good for so short a season, since conditions were very favourable for early growth. The yield of strain 5143 in the variety trial, 350 lb. per acre, represents the general standard of most of the crop, though some acres of poorer soil gave much lower yields. Good progress was made with work on hybridization, which is proving of great interest and most promising. The U.4×Cambodia material has already given types showing a better combination of desirable characters than has been obtained from pure U.4 strains in the past, and there is every prospect of obtaining stable strains retaining these characters. The "quality" crosses represent an attempt to combine lint of high quality with good hairiness of plant in a type with the general field characters of U.4. That this is not impossible for physiological reasons is shown by the fact that single plants showing this combination have already been obtained. It is impossible to judge, at present, whether a pure strain with these characters is a genetic possibility. A point of great interest is that both Sea Island and Egyptian cottons carry a gene, or genes, capable of giving very great density of hairs on the whole plant. Detailed investigation of the degrees and types of hairiness that occur in cotton is urgently required in connection with this hybridization work. The relation between different types of hairiness and jassid resistance, part of the whole problem of resistance to jassid, is also of immediate importance. The preliminary examination of hairiness, started in the present season, will be continued in the coming season as far as opportunity permits. In Swaziland the work on soil fertility is being steadily developed and evidence is accumulating on the immediate needs of both cotton and maize on different types of soil. It will be some time, however, before the results of different methods of soil treatment, as distinct from manuring, become evident.

289. SWAZILAND: COTTON INDUSTRY, 1941-43. (*Ann. Rpt. Emp. Cott. Grwg. Corpn.*, 1941-42.) Planting rains were very late in the 1941-42 season, and this led to a substantial drop in the proposed acreage. The climatic conditions continued unfavourable throughout the season. Drought, violent storms, hail, and intense heat in succession damaged the crop severely, and three weeks of almost continuous rain in March, accompanied by cold weather, stopped growth, caused serious shedding, and led to disease. Yields were naturally very low, averaging only 118 lb. of seed cotton per acre, compared with 186 lb. in 1940-41. Nevertheless cotton made a good showing compared with native food crops, the yield of maize in particular being very poor. The total production of cotton is still extremely small, but there are signs that cultivators are beginning to appreciate its value as a rotation crop for grain.

In 1942-43 the acreage planted was much the same as in 1941-42. That it showed no increase in spite of early and satisfactory rains is attributed partly to the fact that cultivators were preoccupied with food crops after a season of scarcity, and partly to the fact that prices for groundnuts and cereals have advanced much more than those for cotton.

290. SUDAN: RECORD COTTON CROP IN THE GEZIRA. (*Crown Col.*, September, 1943. p. 666.) In spite of labour difficulties most of the record crop of the Gezira has been picked. There is no doubt, however, that if the labour supply had been easier a larger crop would have been gathered.

291. WORK OF THE PLANT-BREEDING STATIONS, 1941-42. (*Prog. Rpts. of Exp. Stats.*, 1941-42, *Emp. Cott. Grwg. Corpn.*) In connection with the work on breeding black-

arm resistant strains of cotton, the 9th backcrosses of N.T.2 and X1730 types were grown and seed produced for sowing propagation plots at Shambat next season. Seed of the 7th backcross of N.T.2 was produced in sufficient quantity to enable a 45-feddan increase area to be sown at the Seed Farm of the Sudan Plantations Syndicate in the coming season, in addition to a series of plots for testing. Sufficient seed of the 7th backcross of X1730 was produced for testing in the Gezira and sowing in a ten-feddan propagation plot. Small quantities of other types were produced for inclusion in 1942-43 tests. These included an N.T.2 backcross homozygous for both factors B_1 and B_2 and therefore highly resistant to blackarm. The 6th backcross stage has been reached with crosses involving factor B_3, which is expected to confer a still greater measure of blackarm resistance. The addition of a gene conferring reddish flowers and leaves has been continued with and has reached the 9th backcross stage.

Crosses between Sakel and Tanguis, made in order to transfer the hairy leaf of the Tanguis strain to a plant of Sakel lint quality with a view to promoting jassid-resistance, have been taken to the 3rd backcross stage and are being proceeded with. Work carried out at the Central Station on leaf curl resistance is progressing satisfactorily. Three promising strains of American cotton are being bulked for further testing, and several promising selections from S.P.20 and S.P.84 (both Uganda cottons) have been isolated and will be tested in the Equatorial Province. Some 335 types of dura have been collected, and the most promising of these are being tested in both irrigation and rainfall areas.

292. SUDAN COTTON, 1942-43. (*Cotton*, M/c, 1/5/43.) The annual reports of the Sudan Plantations Syndicate, Ltd., and the Kassala Cotton Co., Ltd., state that the high quality of the cotton which the Companies produce is a valuable contribution to the war effort, and the yields during the season were satisfactory. The crops, apart from seed, have been disposed of and some progress has been made in the sale of seed, though considerable quantities are still unsold. It would appear that the current crops should be as satisfactory as those of the last two years, but the effect of continued inability to obtain fertilisers and other problems inseparable from war conditions must not be ignored in estimating future prospects. There is a considerable shortage of labour for picking.

293. TAP-ROOT DAMAGE OF COTTON, ASCRIBED TO TERMITES, IN THE SUDAN GEZIRA. By F. Crowther and H. W. B. Barlow. (*Emp. J. Exp. Agr.*, xi., **42**, April, 1943, p. 99.) The paper describes the nature and extent of damage to the tap-roots of the cotton crop of permanent and other experiments at the Research Farm of the Sudan Gezira Irrigation Scheme. From a 4-year survey of the roots when pulled out after harvest it is concluded that the damage is primarily caused by termites. About one-third of the plants comprising the crop at Gezira Research Farm were damaged, and this value varied only slightly from year to year. Damage was invariably greater on land which was cropped in the year before cotton than on that left fallow. Where weeds were allowed to grow unchecked on this fallow the damage to following cotton was greater than where the fallow was repeatedly hoed. These differences are readily explained in terms of the increased vegetable matter, furnished either by the frequent cropping or by weed-growth, which proved attractive to termites. The same explanation holds for the increased damage which occurred when organic or green manures were applied some time before sowing. By contrast, inorganic nitrogenous fertilizers, which gave at least as large yield increases as organic manures, were without effect on the degree of damage. It is concluded that the damage almost always takes place during the first two months after sowing. Termites are often active among the seed-coats after germination, and the damage to tap-roots may arise because the termites, initially attracted to the seed-coats, either move on deliberately to the living roots or damage them accidentally while seeking other seed-coats. Loss of yield by tap-root damage is likely to be not more than 10 per cent. on the injured plants, or on rotations at present practised, which invariably allow a full year's fallow before cotton, about 3 per cent. on the crop as a whole. With closer rotations increased interference by termites must be expected. In

general, the data demonstrate the prevalence and activity of termites under African conditions of agriculture.

294. TANGANYIKA TERRITORY: COTTON INDUSTRY, 1941-42. (*Ann. Rpt. Emp. Cott. Grwg. Corpn.*, 1941-42.) The Director of Agriculture reports that in the territory as a whole the cotton crop planted in 1941-42 was not one of the largest. The weather resulted in much waterlogging and favoured the spread of pests. In the Lake Province the normal acreage produced approximately 34,000 bales as compared with the five years' average of 36,400 bales. Similar conditions affected the other Provinces also, and there, in addition, economic factors such as competition with highly priced food crops for war production also tended to reduce the acreage. Moreover, the cotton crop suffered severely from bollworms and stainers. In the circumstances the production of 51,000 bales in the Territory was not unduly low compared with the five years' average of 61,721 bales during the period 1937-41. The growers were fortunate in escaping by a few months a very severe depression in prices; in fact, exceptionally high prices ruled throughout the season owing to the strong demand from Bombay.

295. UGANDA: COTTON INDUSTRY, 1942-43. (*Crown Col.*, June, July, 1943, pp. 442, 516.) It is officially stated that the smaller cotton crop estimated for 1943 (approximately 100,000 bales) is mainly due to the fact that, in the recent uncertain conditions of marketing, stimulation has been directed to improving grade, quality, and yield per acre rather than to increasing acreage. Cotton seed from Uganda is now being used as fuel, instead of coal, by several East African factories, as a fertilizer on tea, coffee, rubber, and sugar plantations, and, mixed with sesame cake, as cattle food by Kenya farmers.

296. WEST INDIES. WEST INDIAN DEVELOPMENT. COMPTROLLER'S PLAN FOR £6,000,000 ASSISTANCE. (*W. Ind. Comm. Circ.*, March, 1943, p. 49.) Sir Frank Stockdale's Report as Comptroller for Development and Welfare in the West Indies was published in February under the title of "Development and Welfare in the West Indies, 1940-42" (H.M. Stat. Off., 1s. 6d. net). The preliminary portion of the Report, containing a description of the several colonies and islands, their natural advantages and disadvantages, and a summary of their most urgent requirements, shows the magnitude of the task that has to be undertaken and the diversity of the problems. The remainder of the Report, which runs altogether to 93 pages, deals, under subjects—public health, agriculture, labour, education, social welfare and communications—with the work accomplished by the Comptroller and his staff of advisers, the schemes prepared, and proposals submitted for the consideration of Colonial Governments and the Secretary of State up to September 30, 1942. The Report concludes with a tabular analysis of all the schemes for assistance which have been proposed, and shows that at September 30 last the proposals made involved a total expenditure of £5,894,324, of which £1,202,725 had already been approved: £844,266 was under consideration by the Secretary of State for the Colonies, and £3,847,333 was under consideration in the West Indies. Generally speaking, the schemes recommended have as their basis planned development over a number of years. Owing to the war many building projects and schemes involving personnel will have to be deferred, but in several cases proposals have been made and even sanctioned so that action can be taken after the war or when the supply position improves.

297. THE WEST INDIAN SEA ISLAND COTTON ASSOCIATION (INCORPORATED). The Seventh Ordinary General Meeting of the Association was held in Trinidad on December 12, 1942. The report contains the minutes of the business session of the meeting, the report of the Board of Directors, and statistics relating to the Sea Island cotton industry.

Dr. Phillis proposed on behalf of the Montserrat growers that the Association should press for the increased price of cotton lint which the Ministry of Supply had indicated that they would consider in the event of a proved rise in particular costs of production. The Chairman, Mr. C. C. Skeete, pointed out that representations had been made by the Governments of the islands concerned through the Comptroller for

Development and Welfare in the West Indies to the appropriate authorities in England, and their decision was awaited. The meeting recommended that authentic data be made available should the occasion arise to make further representations for an increase in price. Dr. Phillis, also on behalf of Montserrat, asked the meeting to consider the advisability of synchronizing cotton planting seasons throughout the Leeward Islands as a measure towards the establishment of better pest control. The meeting considered it impossible to synchronize the planting dates for the following reasons. In St. Kitts cotton is grown as a catch crop between the reaping and re-planting of sugar-cane, and must be sown in March to May. These months are too dry for the proper establishment of the crop in Nevis and Antigua, and cotton must be planted there in the wet season, September-October, and picked in the dry season, February-May. In regard to the suggestion that cotton cultivations in Montserrat are annually re-infested by immigrant adults of pink bollworm and cotton leaf defoliators from Antigua, the opinion expressed by the Professor of Entomology at the Imperial College was that it seemed highly improbable that heavy infestations of pink bollworm could be due to immigration of moths from Antigua, and there was little point in considering this possibility while sources of re-infestation continued to exist within Montserrat. The possibility of reducing damage by adjusting planting dates was also considered as remote. The meeting was in agreement with the view expressed by the Cotton Adviser, Mr. J. B. Hutchinson, to the Director of Agriculture of the Leeward Islands in October, 1942—namely, that the Montserrat cotton planters should take all possible steps to minimize multiplication of the two pests in the island, and that it must be accepted that infestations will start, but that there is no reason why they should not be kept within reasonable limits if the control measures advocated by Mr. Squire were carried out efficiently. The meeting concluded that if evidence were produced to show that Antigua was the main source of annual re-infestation of Montserrat, the only course left open to Montserrat growers would be to change their planting date to synchronize with that in Antigua.

The Chairman reported that the Agricultural Department of British Honduras was considering the question of developing a Sea Island cotton industry, and on the advice of the Cotton Adviser had made application for an annual supply of pedigree cotton seed from Montserrat. Mr. Hutchinson said that he saw no reason to discourage British Honduras from growing Sea Island cotton, but it was desirable that only pedigree West Indian seed should be planted. The meeting agreed to ask the Government of Montserrat to supply seed to British Honduras.

The difficulty of obtaining adequate supplies of insecticides was also discussed, and the meeting decided that the Association should submit a statement to the Comptroller for Development and Welfare in the West Indies, pointing out the disastrous effects which may result to the West Indian Sea Island cotton industry if adequate quantities of insecticides are not available at the right time, and requesting that steps be taken as far as possible to ensure timely deliveries of the industry's requirements in this respect.

298. The West India Committee: Report of the Executive Committee for 1942-43. (*W. Ind. Comm. Circ.*, June, 1943, p. 107.) The activities of the Advisory Committee in England of the West Indian Sea Island Cotton Association, on which the West India Committee is represented, have again been curtailed by the continuance of war conditions. The total production of Sea Island cotton in the British West Indies during 1941-42 season, amounting to 6,498 bales, was 1,915 bales less than the production in the previous season, with an overall yield of 123 lb. lint per acre compared with 156 lb. in the previous year. The entire crop of clean lint was purchased by the Ministry of Supply. The production of Marie Galante cotton amounted to 952 bales of 400 lb. each.

299. The Imperial College of Tropical Agriculture, Trinidad. In his Report for 1941-42 the Principal writes that "the most notable fact about the College during 1942 is that it has been allowed, and indeed required, to carry on its normal activities almost as though the world were at peace." Thanks to this far-sighted policy on the part of those in authority progress is recorded which is regarded as satisfactory for

any year, and remarkable for war-time. Research was continued on the important crops, cacao, sugar-cane, and bananas, and summaries are included of the investigations carried out by the Departments of Agriculture, Botany, Chemistry and Soil Science, Economics, Entomology, Mycology, and Sugar Technology. A new line of research on Ensilage has been undertaken, and offers a completely new field for investigational work of immediate practical importance. The number of students in residence was thirty-nine. The Associateship was awarded to nine candidates who completed the course in 1941. Forty-one scientific papers were published during the year, including those written for *Tropical Agriculture*. The following additions were made to the Library: parts of periodicals, 6,566; pamphlets, 1,134; books purchased, 87; books presented, 3.

300. Barbados: Cotton Export Levy. (*W. Ind. Comm. Circ.*, June, 1943, p. 115.) An order has been issued imposing a levy of one halfpenny per pound on all cotton exported from the Colony during 1943.

301. The Cottons of Jamaica. By J. B. Hutchinson. (*Trop. Agr.*, March, 1943, p. 56.) A summary of information on the cottons of Jamaica gained during a visit to the Colony in May and June, 1942. The indigenous cotton of the island is *Gossypium hirsutum* var. *Marie-galante*, which is highly variable and exists in a wild state as well as in association with man in house yards and on vacant lots and roadsides. Ecologically, it is the cotton of the xerophytic scrub lands, and is commonest and most variable in the dry southern plains. *G. hirsutum*, the Upland cotton, is only known from Jamaica from specimens recorded by Watt in "The Wild and Cultivated Cotton Plants of the World," 1907. A single plot of *G. hirsutum* var. *punctatum* was found near Black River, but it is known to have been grown from imported seed. Perennial and annual (Sea Island) forms of *G. barbadense* and *G. barbadense* var. *braziliense* have been introduced from time to time in attempts to establish commercial cultivations. The perennial forms have become established in the moister and more mesophytic areas, such as St. Mary and Portland. Mr. Hutchinson expressed the opinion that if pest hazards could be reduced, Marie Galante cottons would offer attractive prospects for the establishment of commercial cotton growing. They are well adapted by their drought resistance and perennial habit to withstand the uncertain and erratic rainfall conditions in southern Jamaica, and there is in that area a considerable peasantry in need of a cash crop, and ample land on which it could be grown.

302. St. Kitts, Nevis, and Anguilla: Cotton Industry, 1942. (*Ann. Rpt. Agr. Dept.*, 1942.) In St. Kitts the cotton crop of 1942 was very poor owing to exceptionally heavy rains and attacks of *Alabama argillacea* and pink bollworm. A good cotton crop was reaped in Nevis in 1941-42; *Alabama argillacea* caused injury to the cotton, but neither in this island nor in Anguilla was there serious damage from pink bollworm. In Anguilla also the cotton yield was better than in the previous season. Marketing of the peasants' cotton in Nevis was continued as in the past. An advance of 4d. per lb. was paid on all clean seed cotton delivered to the Department, and an additional advance of 1d. per lb. was paid later to assist growers in the preparation of land for the next crop. 1,369,482 lb. of clean seed cotton were purchased and 410,519 lb. lint sold to the Ministry of Supply. A price of 1s. 10½d. per lb. was received for the greater part of the crop. After deducting expenses a bonus of 1½d. per lb. for seed cotton was paid, making a total price of 6½d. per lb. for clean seed cotton. Government also advanced ½d. per lb. on stained seed cotton.

303. St. Vincent: Cottonseed Oil. (*Crown Colonist*, May, 1943, p. 371.) Production of refined cottonseed oil in St. Vincent has been stimulated by the war, to the detriment of the import trade in edible oils and fats. Good grade edible oil from the Government cotton ginnery is used extensively for cooking, and from the refinery residues cheap soap is made. Experiments begun in 1938 to determine the effect of manuring on oil formation have yielded valuable data.

COTTON IN THE UNITED STATES.

304. Agricultural Statistics, 1942. (U.S. Dept. Agr. Obtainable Supt. Documents, Washington, D.C., price 75 cents.) This is the seventh issue of this publication, prepared under the direction of the Yearbook Statistical Committee. It includes statistics of grains, cotton, sugar, tobacco, oilseeds, fats, fruits, vegetables, hay, seeds, and minor field crops; beef cattle, hogs, sheep, horses, mules; dairy and poultry statistics; statistics of foreign trade in agricultural products, farm capital and income statistics; agricultural adjustment and conservation statistics; miscellaneous agricultural statistics. A table of weights, measures, and conversion factors used in the Department is included, and the volume is furnished with a useful index.

305. The American Cotton Crop Season, 1942-43. Grade and Staple Report. (*Cotton*, M/c, 5/6/43.) According to a report issued by the Bureau of the Census, Upland cotton ginned in the United States during 1942 was higher in grade than that of 1941, but the staple length averaged about the same. This season 9·5 per cent. was rough ginned compared with 7·2 last season. The grade index of this season's ginnings was 95·0 compared with 94·1 last season. The percentage of Strict Middling White and better was about the same for the two seasons. Middling White included 33 per cent. of ginnings this season and the corresponding figure last season was 31 per cent. Low Middling White and below accounted for less than 13·5 per cent. of this year's crop as compared with 15·2 per cent. last year. The average staple length of ginnings this season was $\frac{31.9}{32}$ inch, practically the same as last season, and there was little change in the proportions of the various lengths. This season, 18 per cent. was $\frac{29}{32}$ inch and shorter, 37 per cent. $\frac{15}{16}$ through 1 inch, 39 per cent. $1\frac{1}{32}$ through $1\frac{3}{32}$ inches, and 6 per cent. $1\frac{1}{8}$ inches and longer. The grade of the American-Egyptian cotton this season was higher, but the average staple length was shorter than that of last season. The production of American-Egyptian cotton was increased from 57,929 bales last season to 73,189 this season. Sea Island cotton was lower in grade and longer in staple this season, but ginnings were only one-fourth of those of last season.

306. Cotton Covers for Baling the 1943 American Cotton Crop. (*Cotton*, M/c, 22/5/43.) Manufacturers of bale wrappers made of cotton will receive an indemnity payment of 40 cents instead of 35 cents on each wrapper manufactured and sold after April 1, 1943. This announcement is made by the U.S. Dept. of Agriculture to ensure the manufacture of sufficient wrappers for the 1943 cotton crop. Some 8,000,000 wrappers are required this year, but total production is expected to be nearer 4,000,000. Baling of cotton in cotton wrappers is one of the Dept. of Agriculture's projects designed to promote new uses and new markets for American low-grade cotton.

307. American Cotton Stocks, 1942-43. By A. B. Cox. (*Text. Wkly.*, 1943, **31**, p. 656. From *Summ. Curr. Lit.*, xxiii., **11**, 1943, p. 292.) A cotton balance sheet for the seasons 1933-34 to 1942-43 is presented and the supply situation is discussed. It is pointed out that there will probably be a carry-over of about 9,700,000 bales in the United States on July 31, 1943. As the new crop will not be available for use in quantity for nearly two months after August 1, there is need, at the rate of present consumption in the United States and export, for a carry-over of 5 to 6 million bales of cotton of the qualities being consumed and exported. The available supply is analysed according to staple length and grade; there seems to be an ample supply of all qualities except $\frac{15}{16}$ inch and $\frac{31}{32}$ inch, and a possible surplus of cotton $\frac{7}{8}$ inch and under, and possibly some of the staples $1\frac{1}{8}$ inches and over. The surplus grades are apparently low middling and below, and strict middling and above. The excess supply of cotton in the United States on July 31 will not exceed 4,000,000 bales, the bulk of which is low-grade short-staple cotton in the hands of the Government. After the last war there was a tremendous demand for low-grade cotton in Europe, and a similar accumulation of low-grade American cotton was readily disposed of. It is suggested that more concern should be shown over present shortages in important qualities of lint cotton and cottonseed products than over the surplus of low-grade cotton.

308. Cotton Standardization and Related Services: Development. U.S. Dept. of Agriculture. (*U.S. Dpt. Agr. Marketing Admin. Serv. and Reg. Announcements*, **163**, 1942. From *Summ. Curr. Lit.*, xxiii., **11**, 1943, p. 305.) A report of developments in cotton standardization and related services which includes reports of International Universal Cotton Standards Conferences, standards for American, Sea Island and American-Egyptian cottons, standards for length of staple, preparation of standards for long-staple cotton, symbols for grade designations for American upland cotton, reasons for variations in the classification of cotton, public cotton classing services, changes in contracts for future delivery, classing and market news services for organized cotton-improvement groups, and cotton-fibre testing services.

309. Climate and Man. (*Yrbk. of Agr.*, 1941, U.S. Dept. Agr., Washington, D.C. Price $1.75.) The invaluable series of yearbooks of agriculture produced by the U.S. Dept. of Agriculture was continued in 1941 by the publication of the sixth of the series under the title of "Climate and Man," and the Yearbook Committee are to be congratulated on maintaining the high standard set by its predecessors. The volume takes the usual form of a symposium of expert articles which will be found most useful by the layman, and a lengthy summary is also included by Gove Hambidge.

The book is divided into five parts under the following headings: Climate as a World Influence; Climate and Agricultural Settlement; Climate and the Farmer; The Scientific Approach to Weather and Climate; Climatic Data—including a wealth of facts about climate and weather in the United States, with special reference to agriculture. A comprehensive index is included, and the volume is well furnished with numerous photographs, diagrams, and maps.

310. American Cotton Industry: War-Time Economy and Research. Cotton Textile Institute, Inc. (*Cotton*, U.S., **106**, 11, 1942, p. 75. From *Summ. Curr. Lit.*, xxiii., **6**, 1943, p. 168.) A report is given of a convention at which the man-power problem in the American textile industry, difficulties of supply and machinery replacement, anti-inflation control, the part of the cotton-textile industry in the war effort, and research, were discussed. The need for more intensive and extensive research on cotton and its products, and for a central research agency, was emphasized. It was suggested that the following three kinds of research should be carried on simultaneously in the industry: (1) Fundamental research aimed at developing basic information about cotton and the machines on which it is processed; (2) Applied research of a general nature, developing the fundamental data into a form capable of translation into commercial use to render the competitive position of cotton generally more favourable; (3) Product research by each and every mill for the betterment of its own products: a keen healthy competition within the industry should be in existence. The need for technologists trained in the research approach to problems was pointed out. The formation for the cotton textile industry of an institute similar to the Institute of Paper Chemistry was urged. The latter is a co-operative research institution which functions as follows: on a specific research problem, the member pays for the job and receives exclusively the results; fundamental and generally applicable research is carried on by graduate students and the results are made available to all members. This institute at the same time is training men, with a research approach, for the members of the industry.

311. American Research Institutions: Organization. (1) L. T. Work. (2) H. B. Hass. (3) D. H. Sheehan and F. J. Curtis. (*Ind. Eng. Chem.*, 1943, **35**, 221 *et seq.* From *J. Text. Inst.*, May, 1943, A284.) (1) A discussion of the definition of research, the growth of technical departments in industrial organizations, research and development sections, the location of research laboratories, and budgeting for research. (2) An account of the policies and practices of the Purdue Research Foundation which was established in 1930 for the purpose of promoting closer relations between industry and the university. (3) Deals with accounting for research, which usually comprises the projection or budgeting of research expenses and the determination of the actual cost.

312. Climate and Cotton. By C. B. Boyle. (*Yrbk. of Agr.*, 1941, U.S. Dept. Agr., Washington, D.C., p. 348.) Cotton is being planted and picked somewhere in

the world every day in the year. So useful is the fibre that many efforts have been made to extend production beyond the naturally favourable climatic regions, and in modern times some of these efforts have been successful through the breeding of rapid-fruiting, early-maturing varieties. It is now generally agreed, the author writes, that the climatic requirements for successful commercial production are a mean annual temperature of not less than 60° F. or, under certain otherwise favourable conditions, of not less than 50°; a frost-free season of 180-200 days; annual rainfall of not less than 20 and not more than 75 inches, with suitable seasonal distribution; open, sunny weather at least half the time throughout the year. Weather conditions have an enormous influence on yield and quality. Cotton thrives best when there is a mild spring with light, frequent showers; a moderately moist summer, warm both day and night; sunny weather during the period of bloom; a dry, cool, prolonged autumn. On the other hand, there is a long list of unfavourable conditions. Cold wet weather in spring may rot the seed, retard seedling growth, favour cutworms and seedling diseases. Rains that cause the soil to pack or crust at planting time may ruin the stand, and too little moisture may prevent germination. Cold winds, sand-storms, and dust-storms early in the season may kill seedlings. Cold nights and hot days while the plants are young favour the cotton louse. Heavy rains and low temperatures in May and June favour diseases and insects. A wet summer induces too much vegetative growth and favours the boll weevil. Severe summer drought often stunts the plants and causes too early maturity. Rainy weather at picking time retards maturity, interrupts picking, damages the exposed fibre. Hailstorms during the growing or harvesting season may do much damage.

The author points out that the peculiar fruiting habit of the cotton plant makes it sensitive to weather conditions over an exceptionally long period. Flowers appear progressively every 2½ days on the fruiting branches that develop up the main stalk, and every 6 or 7 days outward along the fruiting branches. Throughout the entire period of progressive fruit formation, weather influences the quantity of fruit formed, the amount of shedding, the size of bolls, and the quality of the fibre. Among the causes of shedding are insects and diseases, high temperatures that result in excessive loss of moisture through transpiration and evaporation, heavy and continuous rain, abrupt changes in weather, imperfect pollination due to rain, and root injury. The principal cause is probably lack of sufficient soil moisture. Boll weevils increase rapidly as the season advances, and practically all the buds developed later than July are apt to be destroyed. This major handicap of cotton production has been met by breeding rapid-fruiting, early-maturing varieties and working out cultural practices that favour earliness. Federal and State co-operative studies carried out in great detail have proved that both inherited characteristics and weather govern the yield and fibre qualities of cotton. It has not been possible, however, to work out an accurate method of local crop forecasting based on local weather conditions. The author believes this is partly because the right kind of weather data are not available—there is little or no information, for example, on such extremely important factors as soil moisture and transpiration—and partly because the long fruiting period of the cotton plant makes drastic changes in yields possible up to the last minute. For the Cotton Belt as a whole, however, seasonal reports and crop forecasts have been remarkably accurate.

Cotton is bought on the basis of grade standards, and the author points out that exposure to the weather through careless harvesting and storing is responsible for enormous losses to growers, much of it preventable. Cotton that is dull, grey, or blue as a result of delayed picking and exposure in the field sells for about $15 less per 500-lb. bale than high-grade white ⅞-inch staple. Seed too is greatly damaged by careless harvesting and storing. A 500-lb. bale of cotton left uncovered flat on the ground had only 130 lb. undamaged at the end of 8 months as compared with 499 lb. undamaged in a bale stored in a warehouse.

At the end of the paper the author discusses the areas of production of all the commercial types of cotton throughout the world, yields in the principal regions, and the soils and climate of the Cotton Belt of the United States.

313. Textile Mill Laboratory. By R. W. Philip. (*Cotton,* U.S., 1943, **107**, 2, p. 79. From *Summ. Curr. Lit.*, xxiii., **11**, 1943, p. 306.) An account is given of the reconstruction, equipment and work of the laboratory at Tallassee Mills, Alabama. The mills manufacture ducks, drills and twills, and industrial fabrics for the rubber, bakelite and other industries. The laboratory division consists of the main physical testing laboratory room, the chemical laboratory, the office, and the display room. An air-conditioning system is provided and the physical testing laboratory is maintained at 70° F. and 65 per cent. R.H. A list of machines and instruments in use is given. The laboratory personnel consists only of employees with practical mill experience, who at any time can conduct tests in the mills, and have done so before learning laboratory work. The laboratory is under the supervision of the assistant superintendent of the mill, who virtually has the position of technical superintendent. Tests are made on the finished products, and regular tests are made for weight, counts, ends and picks, twist, crimp, gauge, strength, elongation and other physical characteristics. In addition the laboratory staff carries out (1) control testing—*e.g.*, testing of laps, sliver and roving by daily weighings, (2) check testing, including weekly regain tests, and end-breakage, loom stoppage, desizing, viscosity and other tests, and (3) practical research testing, such as tests of blends of cotton to determine spinning qualities, tests of drafts, settings and speeds, and tests of new products, materials and ingredients. On the results of the control tests, the laboratory has the authority over any department to order necessary changes. The results of check tests and practical research tests are reported to the main office and to the departments involved.

314. Breeding California Cotton. By G. J. Harrison. (*Calif. Cultiv.*, **88**, 1941, p. 696. From *Pl. Bre. Abs.*, xiii., **3**, 1943, p. 241.) A fibre laboratory for research purposes, with controlled temperature and humidity, has been in operation since May, 1941. By means of X-ray tests some cotton varieties having fibre of exceptional strength have been discovered, though at present their yield is below average. Tests of resistance to *Verticillium* wilt have been made both in the laboratory and the field; the two tests have given comparable results. Wilt resistance has been shown to be generally associated with late maturity, small bolls and short staple, but certain American-Egyptian varieties have also shown resistance. Direct selection, hybridization and backcrossing are all being used with success in the wilt resistance breeding, and pure genetical research is being carried on at the same time.

315. Georgia: Cotton Variety Experiments, 1938-42. By R. P. Bledsoe and E. D. Matthews. (*Ga. Sta. Circ.*, **140**, 1943. From *Exp. Sta. Rec.*, **89**, 1, July, 1943, p. 59.) Coker 100, Stoneville 2B, and D. and P.L. were high in money value and lint yield per acre in north Georgia tests, 1938-42. Results were similar in 1940 and 1942 except that the yield of Coker 200 also was high. Three strains of Empire, a new variety developed by the station and U.S. Dept. of Agriculture, co-operating, were noteworthy in 1942 tests. Empire is of the Stoneville type but has larger bolls, higher lint percentage, and is early. Its lint length approximates that of the three varietal leaders above. In south Georgia tests, 1938-42, leaders in acre value included Coker 4-in-1, Coker Cleve-wilt 7, and W. W. Wannamaker Cleveland Wilt Resistant. Average results in 1942 resembled those of previous tests, except that Coker Cleve-wilt 7 yielded relatively lower than heretofore. The most promising new strains tested in 1942 were Wannamaker Stonewilt 18 and Bobshaw 1.

316. The Growing of Sea Island Cotton in the Coastal Plain of Georgia. By J. G. Jenkins. (*Ga. Coastal Pl. Sta. Bull.* 33, 1942. From *Exp. Sta. Rec.*, **88**, 2, 1943, p. 188.) Cultural and field practices and harvesting, ginning, and boll weevil control methods involved in growing Sea Island cotton are described, with comments on marketing the crop. Emphasis is placed on planting pure seed, its maintenance and distribution, roguing seed fields, and advantages of one-variety communities in maintaining purity. Dosages for seed treatment are recommended, and a home-made treater is illustrated.

317. Mississippi: Chemical and Physical Properties of Some of the Important Alluvial Soils of the Mississippi Drainage Basin. By R. S. Holmes and W. E.

Hearn. (*U.S. Dept. Agr. Tech. Bull.* 833, 1942. From *Exp. Sta. Rec.*, **88**, 2, 1943, p. 162.) Descriptions are given of the soil profiles and of other samples, including location, drainage, texture, consistency, and colour. Laboratory determinations include mechanical and chemical analyses of the soils, *p*H values, chemical analyses of the colloids, mineralogical determinations on certain colloidal material, and determinations of certain minor elements on a few of the soils. The chemical composition of the non-clay material is estimated.

318. The Delta and Pine Land Company of Mississippi, once Plagued by Floods and Boll Weevils, is now the World's Largest Cotton Seed Dealer. By H. Severson. (*Sth. Seedsman*, **5**, 1942, No. 11. From *Pl. Bre. Abs.*, xiii., **3**, 1943, p. 242.) This season the Delta and Pine Land Company of Scott, Miss., planted its land with a new strain of cotton, Deltapine 14 (44-15). The report of the U.S.D.A. Agricultural Marketing Administration on the spinning quality is as follows: "Deltapine 14 (44-15). Very low percentage of manufacturing waste and strong yarns of good appearance combine to make this an outstanding variety in the test."

319. New Mexico: Labour Needs for Seasonal Operations on Farms. By P. W. Cockerill. (*Bull.* 299, *Agr. Exp. Sta., New Mexico*, 1943.) The scarcity of farm and ranch labour in New Mexico in 1942, while serious, did not result in reduced production of farm and ranch products to any appreciable extent. Where labour shortages occurred producers accomplished the work by working longer hours, employing more family labour, exchanging labour with neighbours, and prolonging certain farm operations beyond the normal period. Such delay, however, in some instances, caused decreased yields and, in case of delayed harvest, a slight lowering of quality of the product. The outlook for 1943 appears much more serious. The prospects are for less available labour and deficiencies in farm machinery and transportation, and it may not be possible to meet the production goals assigned to the State for this year. This is especially true of long-staple cotton, vegetables, peanuts, and dairy produce. Even with normal moisture conditions, production of some farm commodities may be reduced by 10 per cent. as compared with 1942, without a corresponding increase in substitute products.

320. Texas: Gearing Texas Cotton to War Needs. By C. A. Bonnen *et al.* (*Bull.* 624, Texas Agr. Exp. Sta., 1942.) To meet adequately Texas war needs for cottons with good spinning performance, the production of varieties of high spinning quality and staple lengths of $\frac{15}{16}$ inch and longer should be increased. Recent variety tests at Lubbock and other stations show that certain varieties produce lint of $\frac{15}{16}$ inch and longer, and yield, with few exceptions, as much as or more than cottons of $\frac{7}{8}$-inch and shorter staple. Texas has resources peculiarly adapted to the production of cotton at a minimum labour cost. Assuming the most common size and type of farm equipment, labour requirements range as low as 20 hours per acre. A mechanical harvester has been developed which is capable of picking 95 to 98 per cent. of the cotton in the plains area, reduces harvesting labour about 75 per cent., and lowers the quality of the cotton about half a grade.

321. Division of Feed Control Service Permits Additional Grade of Cottonseed Meal. By F. D. Fuller and G. S. Fraps. (*Circ. No.* 97, Texas Agr. Exp. Sta., 1942.) "The Texas cottonseed crushers requested the adoption of a definition of 41 per cent. protein cottonseed meal, which would contain not more than 12 per cent. crude fibre, and gave reasons for their request. The average protein content of Texas cottonseed meal decreased from 47·65 per cent. protein in 1907 to 43·71 in 1915, after which it decreased slightly to 43·26 in 1931-32, and then gradually to 42·79 in 1940-41. The fat decreased from 9·73 in 1907 to 7·38 in 1915, then remained almost constant with fluctuations to 7·51 in 1932-33 and decreased to 6·59 in 1940-41; that is to say, the process of manufacture was improved by increasing the quantity of oil extracted. The crude fibre increased from an average of 6·50 per cent. in 1907 to 10·62 in 1915, after which there were variations in crude fibre but no regular change. In 1940-41 the average crude fibre was 10·28 per cent. When the protein is calculated to a basis free from water, fat, and hulls, there was a sudden but permanent decrease in protein in 1924-25 and a second decrease in 1940-41. Some cottonseed crushers have

had difficulty in manufacturing cottonseed meal containing 43 per cent. protein. Manufacture of a cottonseed product containing 41 per cent. protein if the crude fibre is not permitted to exceed 12 per cent., which is the quantity now permitted in 43 per cent. protein cottonseed meal, would not lower the quality of the product by the introduction of cottonseed hulls. Since cottonseed meal is defined as a product of cottonseed only, composed principally of the kernel, with such portions of the hull as are necessary in the production of oil, if the product does not contain an excess of hulls it may properly be called cottonseed meal. A definition of 41 per cent. protein cottonseed meal was adopted. It must contain not less than 41 per cent. protein and not more than 12 per cent. crude fibre."

322. VIRGINIA: SEVEN-YEAR EXPERIMENT IN COTTON BREEDING AT HAMPTON INSTITUTE. By T. W. Turner. (*Proc. Va. Acad. Sci.*, 1940-41, **2**, 1941, p. 181. From *Pl. Bre. Abs.*, xiii., **3**, 1943, p. 242.) The aim of the Institute has been to breed a strain of cotton which has 5-lock bolls. Of 55 varieties grown at the beginning none had 5-lock bolls only. Oklahoma Triumph produced rather large bolls with 3 to 5 locks per boll. The 5-lock bolls were less than 5 per cent. of the total for the plot. Trice had the same number of locks, but smaller and maturing earlier. In 1934 there were 33 plants bearing 5-lock bolls only, the numbers rising to 312 in 1940; the percentage of 5-lock bolls for the plot was 92, rising to 96 in 1940. Bolls with 5 locks may produce 10 to 11 per cent. more lint than those of 4 locks.

COTTON IN EGYPT.

323. EGYPT: COTTON CROP, 1942-43. (*Cotton*, M/c, 12/6/43.) The yield is estimated at 4,153,000 kantars, compared with 8,204,000 kantars for the 1941-42 season. Government regulations prohibiting the planting of any cotton in some districts, and specifying that only certain varieties should be planted in other districts, decreased the area planted in 1942-43 to 702,627 feddans, against 1,643,629 feddans in 1941-42, but the decrease in production has been relatively smaller. Over the crop as a whole the average yield this season has been 5·91 kantars per feddan, compared with 4·99 kantars per feddan last season, thus providing another instance of the tendency towards higher yields per acre when acreage is reduced.

324. COTTON CROP, 1943-44. (*Cotton*, M/c, 28/8/43.) The Anglo-Egyptian Chamber of Commerce in *Bulletin No.* 19 gives the following information concerning the 1943-44 cotton crop: During May the weather was rather cool but had no bad effects on the growth of the cotton plant. Compared with normal growth, however, the crop is still a fortnight to a month late according to districts. The condition of the crop is fairly satisfactory in some districts, but in areas where resowing has been necessary on a large scale the plants look rather weak. No damage from pests is reported except for a few slight attacks from thrips. Up to the time of writing water for irrigating the crop was adequate.

325. EGYPTIAN LONG-STAPLED COTTON. (*Cotton*, M/c, 3/4/43.) With regard to the new long-stapled Egyptian cotton, described as Giza 39, that is being developed in Egypt, it is stated that the Cotton Research Board carried out extensive tests on the cotton last year, and is satisfied that a big advance has been made. It was already known that this new type gave a yarn strength superior to that of Malaki, the present best variety in the Egyptian range, and the agricultural merits of high yield per acre and clean, high-grade cotton appear also to be proved. In addition, this cotton has a lighter colour than Karnak and Malaki. Egyptian-grown Malaki, of which the civilian trade before the war had very little experience, is probably now being used almost exclusively for military fabrics, but there seems every reason to believe that after the war it will form a keen competitor to Sea Island in high-quality fabrics, and the competition of Egyptian-grown cotton will be made still keener with the coming into production of Giza 39.

[*Cf.* Abstr. 77, Vol. XX. of this Review.]

COTTON IN OTHER FOREIGN COUNTRIES.

326. ABYSSINIA: GUIDA PER L'INSEGNAMENTO PRATICO DELLA COLTURA DEL COTONE. (Pubd. by Compagnia Nazionale per il Cotone di Etiopia, 1940.) This booklet is a guide to the practical cultivation of cotton in Abyssinia. It gives instruction for the preparation of the land before sowing; planting the seed; care of the cotton plantation after sowing; cotton pests and diseases; harvesting the crop.

327. ETHIOPIA: NOTES ON AGRICULTURE. By Major F. de V. Joyce. (*E. Afr. Agr. Jour.*, January, 1943, and subsequent numbers.) Opening with a statement of the objects to be achieved by an agricultural policy for the country, the author goes on to discuss the following: Natural features—soils, water and rainfall, grasses, trees and forests, wild life; livestock; food crops; plantation crops; soil conservation; communications, transport and power; agricultural industries. In regard to the cotton industry it is stated that before the Italian occupation of the country the imports of raw cotton, cotton thread, and cotton piece-goods amounted to about 7,500 tons per annum. Italy had many ambitious schemes for stimulating production in Ethiopia, but these were based on the object of making Italy and her Empire as self-supporting as possible, rather than on sound economic development. In view of Ethiopia's indifferent communications, immense consumption of cotton, and the large exports required to balance the import of cotton, the policy should be to stimulate local production, provided this be not done at the expense of the land. The Italians established ginneries at Alomata, Adama, Sodhu, Lechemu, and Diredawa, and at the latter place erected a large spinning and weaving mill capable, it is said, of a maximum production of 9,000 metres of good quality unbleached cloth per day. The factory obtained only a fraction of its raw cotton requirements locally, and imported raw cotton from India, Iran, and elsewhere. Cotton has always been grown in small patches all over Ethiopia at suitable altitudes, and is hand spun and woven into coarse but useful cloth by the countrywomen. This industry should be encouraged in every possible way, and it might be helped by the introduction of a better type of hand loom.

328. ARGENTINA: MEMORIA ANUAL DE LA JUNTA NACIONAL DEL ALGODON, 1941. (Min. de Agr. Argentine, No. 60, 1941.) A detailed report of the state of the cotton industry in the country during the 1940-41 season, and measures taken for its maintenance and improvement. The various sections of the report deal with the following: Production; marketing; the textile industry; work of the Experiment Stations and the Chemistry Laboratory; cotton seed; technology; labour in the agronomic regions; co-operative societies; encouragement of cotton growing in new areas, etc.

329. COTTON PRODUCTION IN ARGENTINA, 1940-41. (*Mem. Anual, Junta Nac. del Algodon, Argentina*, 1941, **60**, pp. 11, 101. From *Summ. Curr. Lit.*, xxiii., **8**, 1943, p. 205.) In the season 1940-41 the area planted with cotton amounted to 336,600 hectares and the area harvested to 298,485 hectares, the latter figure being about 1·3 per cent. higher than the corresponding figure for the previous season. Production amounted to only 50,337 tons of fibre, a reduction of 36 per cent. compared with the previous season. Most of the cotton (75·6 per cent.) was of grades C to E, 30·6 per cent. being grade D. These results are attributed to unfavourable climatic conditions and to shortage of labour for picking. Most of the fibre (92·3 per cent.) had a length of 23-26 mm., 35·5 per cent. being of 24 mm. In Salta about 100 hectares were sown with the variety Coker Wild 11 and produced strong, fine cotton of 32 mm. length. The total number of ginneries in the country was 148, 7 less than in the preceding season, and 126 were in operation during the 1940-41 season. Tables are given showing ginning results and the monthly progress of ginning in the various provinces and territories. Increases in the yield of ginned fibre and further progress in individual ginning are reported. Areas harvested, actual yields of seed cotton and fibre, and yields per hectare are shown for the various provinces and territories.

Yield in Relation to Climatic Conditions.—Climatic conditions in Argentina during the various stages of the 1940-41 cotton-growing season are reviewed and tables are given showing humidity and temperature conditions and yields of fibre and seed

cotton per hectare obtained at various ecological stations with the varieties Delta 11A, Mebane Triumph, Coker Wild 8, Stoneville 5A, Coker Wild Strain 7, Delta 12, Farm Relief 4, Acala Blue Tag, Coker 100, Paymaster, Carolina Foster, and the native Chaco type cotton.

330. Belgian Congo: Le Choix de la Variété de Coton dans les Districts de L'Uelé et de L'Ubangi. By M. Waelkens and M. Lecomte. (*Publ. Inst. Agron. Congo Belge*, Ser. Tech., **29**, 1941. From *Pl. Bre. Abs.*, xiii., **3**, 1943, p. 242.) A detailed account of the selections of the families 145 and 270 and certain other varieties, their characters and behaviour under different conditions. As a result of the investigation, D65 of family 270 is of most value to the manufacturer, and C55 of 145 to the natives on account of its high yield of seed, but these findings require modification according to the district concerned.

331. Brazilian Cotton. (*Cotton*, M/c, 15/5/43, 12/6/43, 10/7/43.) The 1942-43 cotton season terminated in March, and according to official figures for the Paulista crop, 99·99 per cent. of the total of 281,646 metric tons was of 28-30 mm. staple, or an identical percentage to that for the previous crop. In classification by types, however, only 36·28 per cent. was of basic type 5 or better, against 67·17 per cent. for the previous crop. An outstanding feature was the smaller quantity of seed cotton required to produce a given unit of ginned cotton. In many districts only 44 kilos were required to yield an *arroba* (15 kilos) of clean cotton, compared with from 50-52 kilos only a few years ago.

The yield of the 1943-44 cotton crop of São Paulo is estimated at 350,000 tons. The new cotton crop throughout northern Brazil is expected to be of much better quality than that of last year owing to the general seasonal rainfall. It is stated that the announcement that the Federal Government would finance the 1943-44 Paulista cotton crop on the basis of Cr. $66 per *arroba* of seed cotton has given rise to some dissatisfaction in cotton-growing circles, which had petitioned the Government for an official basis of financing of Cr. $80 per *arroba*.

332. Brazil: New Cotton Contract. (*Cotton*, M/c, 17/4/43.) In the hope of increasing business on the São Paulo Produce Exchange and, later, of reducing the present cost of term operations, it is reported that the Board of Directors have decided to modify procedure so far as negotiations in cotton are concerned. A new contract was accordingly introduced in November last, and until such time as the existing "A" and "C" contracts expire (the last trading month being July, 1943), it will be called the "*Contracto Unico.*" The principal features of the new contract are: Quotations will be made only for 6 months of the year, these "active" months—which coincide with those quoted on the New York and Liverpool markets—being January, March, May, July, October, and December. Later it is intended to quote all 12 months, and the market will then make its own "active" months. The quotations for this contract will be for type 5, but operators will be able to deliver any cotton from type 1 to 7, invoicing with the discount or premium for the type delivered on the day of effective delivery. There are several other innovations which seek to bring procedure in line with that on the New York and Liverpool markets.

333. Iran: Cotton Crop, 1942. (*Cotton*, M/c, 12/6/43.) Owing to a large-scale shift from cotton cultivation to food crops which was encouraged by the Iran Government, the cotton crop in 1942 amounted to 120,000 bales of 478 lb. each, according to Government estimates, compared with 184,500 bales in the previous season.

334. Iraq: Cotton Industry. (*Cotton*, M/c, 28/8/43.) The cotton crop of 1942 is estimated at between 10,000 and 12,000 bales of 400 lb. compared with approximately 19,828 bales in 1941. The acreage was reduced in 1942 to permit increased cultivation of cereals.

335. Paraguay: Cotton Industry. (*Cotton*, M/c, 10/7/43.) Cotton growers are guaranteed for their crop now being harvested a price of 200 pesos per 10 kilograms of seed cotton (equivalent to 2·72 cents per lb.). This new price is 20 pesos (0·28 cent per lb.) higher than the seed cotton price for the 1942 crop, and 50 pesos (0·68 cent) higher than that guaranteed for the 1941 crop. Government has granted these

price increases in order to maintain the farmers' interest in cotton cultivation as an important cash crop of the country.

336. PERU: RESTRICTIONS ON THE MOVEMENT OF COTTONSEED ANNULLED. (*Cotton*, M/c, 25/9/43.) By a recent decree the Peruvian Government has removed the regulation imposed on September 20, 1929, prohibiting the movement of cottonseed from the areas of production in the northern Provinces (Piura, Lambayeque, and La Libertad) to other parts of the country. The original decree was intended to protect the interests of the cottonseed crushers in those Provinces by requiring the seed to be crushed in the valley of production. The new decree permits unrestrained movement of cottonseed throughout the Republic.

Exports of cottonseed have been prohibited since January, 1943, owing to a threatened shortage for local oil mills. This shortage is attributed both to restricted cotton acreage and to increased domestic consumption of cottonseed oil in place of other edible oils formerly imported from Axis-dominated areas.

337. SCIENCE IN SOVIET RUSSIA. By J. Needham and J. S. Davies (Editors). (Watts and Co., London, 1942. Price 1s. 3d. Reviewed *Pl. Bre. Abs.*, xiii., **2**, 1943, p. 172.) In this small booklet edited by the above, Dr. Needham himself contributes an article on Biological Science in the Soviet Union, which includes references to the work of Soviet geneticists such as Koltzov, Iljin and Vassin, as well as a very succinct outline of the "genetics controversy." Special emphasis is laid on the advantage that research in the U.S.S.R. gains over research in most other countries on account of the greater mechanical facilities afforded to it. The chapter on "Soviet Agricultural Science" by Arthur Walton is devoted to the development and expansion of the so-called "pyramid of research personnel" in the investigation of purely practical agricultural problems. The booklet also contains articles on Soviet physical, medical and other applied sciences.

SOILS, SOIL EROSION, AND MANURES.

338. SOIL-FORMING PROCESSES: PEDOLOGY IN THE SERVICE OF SOIL SCIENCE. By J. S. Joffe. (*Soil Sci. Soc. Amer. Proc.*, **6**, 1941. From *Exp. Sta. Rec.*, **89**, 2, 1943, p. 168.) The author presents pedology as the basis of soil science and suggests that it is to become the stepping-stone in deciphering many soil problems confronting the scientific investigators and practical farmers engaged in the many branches of agriculture. Associating specific and puzzling soil questions with the soil-forming processes, one should be able to recognize the probable reactions of any particular method of managing the soil as a medium for plant growth, the ultimate aim of these studies. Concrete and specific examples are cited, showing how soil investigations of yesterday and even of to-day have not borne the desired fruit, or the results have been meagre because of the detached position of these investigations from the fundamentals of pedology. These fundamentals point to each zonal soil possessing a physicochemical system of its own. Hence, the experimental procedure should differ and the results of the experiments be interpreted accordingly.

339. SOIL GENESIS FROM FRAGMENTAL VOLCANIC ROCKS IN THE LESSER ANTILLES. By F. Hardy and G. Rodrigues. (*Soil Sci. Soc. Amer. Proc.*, **6**, 1941. From *Exp. Sta. Rec.*, **89**, 2, 1943, p. 169.) The relationships between eight soil types derived from the various fragmental volcanic rocks of the Lesser Antilles, which belong to one petrological province, are presented to bring out the effect of age, rainfall, topography, and porosity as factors in soil genesis and pedological evolution.

340. MECHANICAL COMPOSITION OF EAST AFRICAN SOILS. By G. Milne and W. E. Calton. (*E. Afr. Agr. J.*, viii., **4**, April, 1943, p. 202.) The lack of any consistent relation between mechanical composition of East African soils and their field properties is discussed. An attempt is made to trace the changes in mechanical composition occurring with progressive soil development on various parent materials. Examples are given to show the range of mechanical types found in East Africa.

341. INDIA: BLACK COTTON SOILS, MOVEMENT OF WATER IN. By L. A. Ramdas and A. K. Mallik. (*Proc. Ind. Acad. Sci.*, 1942, A16, pp. 1 and 16. From *J. Text Inst.*, April, 1943, A172.) A simple laboratory method of studying the ascent of moisture

and aqueous solutions through soil is described. The effect of packing on the rate of upward movement is discussed; at maximum packing the rate is one-third of that at minimum packing. The influence of various percentages of sand mixed with the black cotton soil in increasing the permeability and rate of upward movement of moisture is discussed. A small quantity of lithium or sodium carbonate reduces the rise of water, lithium carbonate being the more effective. The swelling of the colloidal material in black cotton soils in solutions of a number of substances is described. Lithium carbonate is the most efficient swelling agent. The effect of prolonged heating is to destroy the organic colloids covering the particles. This leads to the absence of swelling and a marked increase of permeability.

342. The Fractionation of the Organic Matter, Including Nitrogen, of Certain Soils and its Relation to their Quality. By M. R. F. Ashworth. (*J. Agr. Sci.*, **32**, 4, 1941, p. 349.) The proximate analysis of a number of widely differing soil profiles has been carried out, employing a slight modification of the scheme used by Waksman and Shewan. This included a nitrogen fractionation with water and acid, similar to that of Waksman and of Shewan. It was supplemented by ammonia and nitrate estimation. The data are expressed on the basis of total organic matter. The soils ranged in quality from peat and forest soils to grassland profiles. This gradation of quality was brought out by many of the figures of the proximate analysis. The better quality soils are associated with (*a*) a lower average content of fats and waxes, hemicellulose and cellulose; (*b*) a rapid decrease in cellulose with increasing depth; (*c*) higher total nitrogen and various fractions, including higher ammonia and nitrate and a higher ratio of nitrate to ammonia; (*d*) a higher proportion of more soluble nitrogen. The ratio of the average dilute-acid-soluble nitrogen to the average residual nitrogen for the profile as a whole increased regularly with improving quality of soil. In all profiles the total nitrogen and its various fractions generally increased with increasing depth. The water-soluble organic matter and lignin showed no obvious correlation with soil quality. In general, the water-soluble matter decreased with increasing depth. The lignin showed overall increases with depth. The method of investigation used appears to provide a satisfactory approximate picture of the distribution and amount of nitrogenous groups in soil organic matter in fractions which can be associated with soil quality.

343. Phosphate Fixation in Soil and its Practical Control. By F. E. Bear and S. J. Toth. (*Indus. and Eng. Chem.*, **34**, 1, 1942, p. 49. From *Exp. Sta. Rec.*, **88**, 2, 1943, p. 167.) Observations of agronomists on crop recovery of applied phosphate within the soil profile, increased response to phosphate fertilization placed in bands, and small loss of phosphate in the drainage water are explained on the basis of phosphate fixation. The factors discussed in connection with phosphate fixation include microbiological consumption, chemical precipitation, and physicochemical adsorption. Fertilizer placement both in bands and below the zone affected by cultivation and summer drought are suggested for increasing the effectiveness of applied phosphate.

344. Adsorption of Chloropicrin and Other Fumigants by the Soil. By F. L. Stark, Junr. (*Phytopathology*, **33**, 1, 1943, p. 12. From *Rev. App. Ent.*, xxxi., Ser. A, **7**, 1943, p. 276.) By means of a microbalance the weight of chloropicrin and other soil fumigants adsorbed by soil particles was determined. The amount of gas adsorbed is dependent primarily on size of the soil particles, soil temperature, and concentration of gas. Heavy soils having a large clay fraction may adsorb chloropicrin up to 10 per cent. of their weight from a saturated atmosphere. Degree of aggregation of soil particles has little influence on either the quantity of gas adsorbed or rate of adsorption. Carbon bisulphide is taken up in smaller quantities than chloropicrin and at a much slower rate than either chloropicrin or formaldehyde. Formaldehyde is adsorbed to a less extent than carbon bisulphide but at about the same rate as chloropicrin. Adsorption probably impairs the efficiency of volatile fumigants by reducing the concentration and the diffusion of vapour in the soil, especially in the case of chloropicrin. Because some soil fumigants are more readily adsorbed than others, the efficiency of one may be impaired more than another when

a heavy soil is treated, which may account for the differences obtained in investigations on the relative effectiveness of various soil fumigants.

345. Effect of the Soil Mulch. By L. L. Eksteen and M. J. van der Spuy. (*Frmg. in S. Afr.*, February, 1941.) From experiments carried out at the Glen College of Agriculture, South Africa, in 1938, it cannot be deduced that a soil mulch has any noticeable effect on the evaporation of moisture from soil in which the underground water level is very deep. The crop yield can be greatly increased by controlling weeds effectively during the early stages. Cultivation of the soil reduces run-off. Soils cultivated to a rough, broken surface do not easily become wind-blown.

346. Soil Moisture and Wilt Disease. See Abstr. **419**.

347. Germination of Cottonseed as Affected by Soil Disturbance and Machine Placement of Fertilizer. By H. P. Smith *et al.* (*Bull. No.* 616, Texas Agr. Exp. Sta., 1942.) Experiments were conducted at College Station and Nacogdoches from 1936-40 inclusive to determine the effect of machine placement of fertilizer and the effect of soil disturbance on the germination of cottonseed. When a 4-12-4 commercial fertilizer was placed under the seed at depths of 1, 2, and 3 inches below the seed there was an increase in the percentage of emergence and yield. Fertilizer placed directly under the seed at the time of planting injured the root system and in most cases stopped the development of tap-roots at the level of the band of fertilizer. When only the soil was disturbed directly under and at the several depths below the seed, the percentage of germination decreased with the depth of the disturbance. Where fertilizer was not applied normal tap-roots developed. The best emergence and stands were obtained when the fertilizer was placed 2 inches to each side and 1 and 2 inches below the seed level. In all the side placement tests the root systems of the young seedlings were not injured, and normal tap-roots developed.

348. Cotton Plant: Utilization of Nutrient Materials. By S. A. Kudrin. (*Chem. Soc. Agr., U.S.S.R.*, **9**, 6, 1940, p. 12. From *Summ. Curr. Lit.*, xxiii., **7**, 1943, p. 170.) The cotton plant utilizes nitrogen better from mineral fertilizers than from manure, whilst the reverse is true of phosphorus. If the two forms of fertilizers are mixed the utilization of both N and P is somewhat increased. Both N and P are utilized better from oil cake. In the experiments reported, the utilization of N was 30 to 60 per cent. and that of P 15 to 30 per cent. Whilst it is difficult to improve utilization above these values, it can be accomplished by proper choice of the form of fertilizer and careful application.

349. A Chemical Study of Quick-Test Techniques for Potassium and Calcium. By S. W. Melsted. (*J. Amer. Soc. Agron.*, **34**, 6, 1942, p. 533. From *Exp. Sta. Rec.*, **88**, 2, 1943, p. 149.) This article covers a chemical evaluation of various techniques involved in quick tests for potassium and calcium. The author points out that the principal factor which determines the accuracy of a quick test for replaceable bases is the quantitativeness with which the extracting solution removes the bases from the soil. With this in mind, it is suggested that the first consideration must be the extracting solution. Results obtained indicate that there is no one extracting solution in use for rapid tests that is quantitative for all the replaceable bases, and in the opinion of the investigator, a single extracting solution now in general use for all nutrients should be discouraged. The limitations of quick-test methods that measure the aliquot of extract in drops, as well as turbidimetric or colorimetric methods that do not give accurate results with standard solutions, are discussed.

350. Central Asia: Effect of Potash on Cotton Plant. By E. A. Zhorikov. (*Chem. Soc. Agr., U.S.S.R.*, **9**, 6, 1940, p. 17. From *Summ. Curr. Lit.*, xxiii., **7**, 1943, p. 170.) On the grey soils of Central Asia which are not high in salts the use of K salts increased the cotton yield 8 to 20 per cent. Such treatment was not effective on the salty soils. The growing of alfalfa sharply reduced the readily assimilable K; after ploughing under, it gave the best base for the application of K fertilizer. With the use of 90-100 kg. per ha. of N and P the optimum amount of K_2O was 45-50 kg. per ha. Larger doses of K_2O (75-100 kg. per ha.) required the use of about 200 kg. of N and P or the planting of alfalfa as a green crop. The ratio of N : K was 2 : 1 for old fields and 1 : 1 after a crop of alfalfa. The best results were obtained by using

40-50 per cent. of the yearly dose of K at the time of planting and the remainder at the time of budding or blooming.

351. GEORGIA: THE INFLUENCE OF NEUTRALIZING ACID-FORMING FERTILIZERS WITH DOLOMITE LIMESTONE ON THE RESPONSE OF COTTON TO POTASH. By J. G. Futral and J. J. Skinner. (*Ga. Sta. Bull.* 223, 1942. From *Exp. Sta. Rec.*, **88**, 6, 1943, p. 739.) Seven soil types were included in a comparative study of acid- *v.* non-acid-forming fertilizers, the non-acid-forming fertilizers having been neutralized with dolomitic limestone. The effect of the dolomitic limestone on potash availability was determined with cotton. Fertilizers containing dolomitic limestone gave larger yields of cotton than acid-forming fertilizers on Cecil fine sandy loam, Clarksville gravelly loam, and Norfolk and Appling sandy loam soils. Only a small increase in yield resulted from non-acid-forming fertilizers over acid-forming on Orangeburg, Tifton, and Greenville sandy loams. Using dolomitic limestone to neutralize acid-forming fertilizers resulted in practically the same increase in yield without regard to the potash content of the fertilizer. The authors thus conclude that neutralizing acid-forming fertilizers with dolomitic limestone does not materially affect the crop's response to or requirement for potash.

352. PREPARATION AND USE OF ARTIFICIAL MANURES. By K. J. Kucinski. (*Massachusetts Sta. Bull.* 395, 1942. From *Exp. Sta. Rec.*, **88**, 2, 1943, p. 165.) Corn stover, mixed deciduous leaves, oat straw, and mixed leaves and garbage were used in making artificial manure. The author discusses methods of preparation for small- and large-scale amounts. Data are presented on the rate of decomposition, heat and moisture relationships, chemical analyses of the products, and volume and appearance of the finished product, as well as results from pot and field experiments. Both chemical and vegetation tests showed that when cyanamide or ammonium sulphate was used in the preparation of manure from corn stover, oat straw, or leaves and garbage, a finished product resembling well-rotted farmyard manure was obtained. Leaves used alone decomposed to form artificial manure very slowly, while corn stover decomposed most rapidly.

353. GROUND LIMESTONE AND SOIL FERTILIZERS. (*Trop. Agr.*, April, 1943, p. 84.) It is considered in Illinois that the most economical grinding of limestone is probably that which provides a gradation of sizes finer than 6-mesh. A small amount of coarser material up to 4-mesh ($\frac{1}{5}$ inch) is permissible, although the action of such coarse material is very slow. It was found to take about a year or eighteen months for soil to have its acidity reduced appreciably throughout a range of about $\frac{1}{4}$ inch from a fixed mass of limestone. In pasture experiments limestone was the most effective single agent in increasing the total growth of forage over the whole grazing season, a combination of limestone and phosphate being more effective than was either material alone.

354. COTTONSEED MEAL ASH AS A FERTILIZER. By P. Correa de Mello. (*J. Amer. Soc. Agron.*, **34**, 7, 1942, p. 677. From *Exp. Sta. Rec.*, **88**, 2, 1943, p. 168.) Due to the loss of northern European markets for cottonseed meal, the price has declined to the point where the producers of the meal are beginning to use it as a fuel, which results in a fertilizer material known as cottonseed meal ash. Cottonseed meal ash is made up in its entirety of phosphates, potash, magnesium, and calcium, with the amount of carbonate practically insignificant. Its value as a fertilizer has been confirmed by some of the producers in various ways, and for this reason the author decided to prepare this brief article in order to dispel whatever doubt exists as to its true value as a fertilizer. He presents the following analysis as representing typical cottonseed meal ash: SiO_2 0·92 per cent., P_2O_5 43·60, K_2O 32·70, MgO 17·80, and CaO 5·70 per cent.

355. A QUICK METHOD OF MAKING HUMUS. (*Trop. Agr.*, February, 1943, p. 44.) A system of composting is described in the *New Zealand J. Agr.*, **64**, 125, whereby complete breakdown of material is achieved in a few weeks. The method differs from ordinary composting only in the introduction of air vents into the base of the heap. The humus-making plant described is an above-ground receptacle of cement and boulders 8 ft. by 3 ft. and 2 ft. 9 in. deep, divided midway by a partition. At the

bottom of each container a 12-inch square is dug and covered with heavy wire netting. Leading to the outside from each 12-inch square is a 9-inch pipe. The indraught of air through these pipes appears to stimulate the heating process. Larger pipes slow down combustion. Material placed in one container is turned into the other in 3 weeks and is ready for use in a month or six weeks later. Wood shavings and sawdust, if used in small quantities, quickly disappear.

356. Changes Occurring in the Organic Matter during the Decomposition of Compost Heaps. By M. R. F. Ashworth. (*J. Agr. Sci.*, **32**, 4, 1941, p. 360.) The decomposition of the organic matter of four medium- to large-scale composts has been studied by analysis of samples taken at intervals. The bulk materials of the composts were grass-cuttings, oat-straw, *Sphagnum* peat and an *Eriophorum* and *Sphagnum* peat. All were made up to the same nutrient content and relative water content. The analytical method used was a modification of the scheme of proximate analysis used by Waksman and by Shewan. It was supplemented by ammonia and nitrate determinations, using Olsen's method. The following observations were made:

A. *All Composts.*—(i) An increase in ammonia, water-soluble nitrogen, and water-soluble organic matter took place during the first month. (ii) Only low nitrate concentrations were developed. (iii) Very closely parallel changes in H_2SO_4-soluble nitrogen and residual nitrogen were recorded. (iv) Other nitrogen changes can be described as slight and on the whole as mutually compensating fluctuations.

B. *Peat Composts.*—(i) The changes in the two peat composts were similar and were confined chiefly to the nitrogen fractions during the first month of composting, the less soluble nitrogen tending to become converted to more soluble forms. (ii) Insignificant changes were recorded in carbohydrates, lignin, and fats and waxes. (iii) It seems likely, therefore, that in the peat compost heaps the changes recorded were confined chiefly to the dried blood added as a source of nitrogen. The peat itself was scarcely affected.

C. *Grass and Straw Composts.*—(i) Changes were not regular but showed temporary fluctuations which were most pronounced in the nitrogen content of the grass and of its fractions. (ii) Decomposition of hemicellulose and cellulose occurred during the first month in the grass compost, which at that time developed a high temperature. In the straw compost, which did not heat well because of its open structure, this decomposition occurred in the second month. (iii) A small overall increase of lignin took place. (iv) Increases in total nitrogen were recorded. (v) In the straw compost early accumulation of ammonia was accompanied by losses of HCl-soluble nitrogen, and after the first month these changes were reversed. The corresponding changes in the grass compost were not so apparent.

In composting, the grass and straw underwent changes which increased their resemblance to dung—*e.g.*, carbohydrate breakdown, accumulation of lignin and nitrogenous matter. On the other hand, the peats remained more or less unaltered. It is concluded, therefore, that these peats did not compost, and that the chief value of peat in the compost heap is as an absorbent of water-soluble nutrient—*e.g.*, ammonia—liberated during the process of composting.

357. La Accion Toxica del Selenio. By J. E. Wille. See Abstr. **383** in this issue of the Review.

STATISTICAL TREATMENT, CULTIVATION, IRRIGATION, GINNING, ETC.

358. Statistical Analysis in Biology. By K. Mather. (Methuen and Co., Ltd., London, 1943. 16s. Reviewed *Pl. Bre. Abs.*, xiii., **3**, 1943, p. 272.) This is a book written by a biologist for biologists, and is a good introduction to the use of most methods of statistics which are required by them. The author has succeeded in reaching a satisfactory compromise between the type of book which is so mathematical as to be unreadable by the biologist, and the opposite type which is a pure catalogue of methods to be used by rule of thumb. After an introductory chapter on the nature of statistics, populations and samples and diagrams, and another on

probabilities and significance, an account is given of the normal, binomial and Poisson distributions. A description is then given of the t, z and X^2 distributions and their interrelations. There follow chapters on the significance of sums and means, degrees of freedom and the analysis of variance, the planning of experiments, regressions, and correlations. The use of X^2 in the analysis of frequency data is described fully, and finally there is an account of the estimation by the method of maximum likelihood. The reviewer agrees with the author that the biologist should be able to understand a certain amount of algebra, and that some elementary algebra on topics such as the partitioning of degrees of freedom or the partitioning of X^2 should be helpful towards understanding the general methods. It is thought, however, that the arrays of degrees of freedom given are needlessly long, and may easily put the reader off the subject. Secondly, if algebraic proofs are given, they should be as easy and concise as possible; in this connection the algebra of the partitioning of X^2 presented on pp. 177, 179, 198 and 199 is most laborious and inelegant. The examples chosen to illustrate the arguments are in general quite good, but the preponderance of examples from genetics in some of the chapters is unfortunate but perhaps unavoidable. It is felt that the inclusion of a chapter on the treatment of toxicological data by the method of probits would have enhanced the value of the book, and a short section on other transformations of variates would be useful. Finally, in spite of the above criticisms, this book can be strongly recommended to all biologists.

359. Statistical Tables for Biological, Agricultural and Medical Research. By R. A. Fisher and F. Yates. (Oliver and Boyd, Ltd., London and Edinburgh, 1943. 2nd edn. 13s. 6d. From *Pl. Bre. Abs.*, xiii., 3, 1943, p. 272.) In this second edition the new material consists of two further tables (V_1 and V_2) for the test of the significance of the difference between two means obtained by different methods: Table VIII, which gives upper and lower limits for the expectation based on the binomial and Poisson distributions when *a* occurrences out of *N* have been observed, and Table $VIII_2$, which gives densities of organisms estimated by the dilution method. The combinatorial solutions of Table XVII have been considerably extended and simplified in presentation by the more extensive use of solutions of the cyclic type, while the corresponding section of the introduction now gives an account of Youden's Squares and of the method of utilizing information, formerly discarded, from comparisons between blocks. A list of errata in the first edition has also been included.

[*Cf.* Abstr. **456**, Vol. XVI. of this Review.]

360. Chemistry and Agricultural Reconstruction. By Sir E. J. Russell. (*Trop. Agr.*, April, 1943, p. 74.) From the Messel Lecture delivered before the Society of Chemical Industry and reprinted from *Chemistry and Industry*, vol. 61, 30, the introductory remarks which include references to agricultural production in England and Wales have been omitted. The present section of the paper discusses the following: The food production problem; the achievements of the chemist—(*a*) the empirical period, (*b*) the scientific period; the difficulties of applying science to agriculture—(*a*) natural difficulties, (*b*) difficulties removable by administrative action; administrative changes; difficulties not confined to agriculture; agricultural science and its applications in the reconstruction period. The author writes in conclusion: "It seems clear that the application of science to agriculture in the future will be on a wider basis than in the past. It will no longer suffice simply to know how a particular nutrient or treatment affects the yield; the effect on composition must be studied, and on the intrinsic and the market values of the crop and its reaction to disease organisms. Like everyone else the chemist must specialize, and so he cannot be expected to become expert in a number of different sciences. But he must cultivate the art of working with other people. As the years go by this need will become more insistent, and success will go to those who have the gifts of co-ordinating the efforts of different scientific workers and of synthesizing into a coherent pattern the multitudinous fragments of truth that they succeed in finding."

361. The Design of Experiments. By R. A. Fisher. (Oliver and Boyd, Ltd., London and Edinburgh, 1942. 3rd edn., 12s. 6d. From *Pl. Bre. Abs.*, xiii., 3,

1943, p. 272.) The third edition of this valuable book differs little from the second edition. Sections have been added on the possibilities of confounding with many factors and on the method of double confounding.

[*Cf.* Abstr. **463**, Vol. XIV. of this Review.]

362. New Cyclic Solutions to Problems in Incomplete Blocks. By R. A. Fisher. (*Ann. Eugen.*, **11**, 1942, p. 290. From *Pl. Bre. Abs.*, xiii., **3**, 1943, p. 177.) Cyclic solutions are given for the problems of randomized blocks and Youden's squares for the cases associated with completely orthogonal 8×8 and 9×9 squares. An examination of the 9×9 squares derived from the second solution shows that there is only one species of Latin square, but two species of tetrics, Græco-Latin squares, and two species each of pentics and hexics. The solutions hitherto given of orthogonal 9×9 squares appear both to be the same as that derivable from the cyclic solution.

363. Crop Rotation as a Factor in Soil Erosion Control. By R. J. Carreker. (U.S. Dept. Agr., *Agr. Eng.*, **23**, 6, 1942, p. 190. From *Exp. Sta. Rec.*, **88**, 2, 1943, p. 164.) Work from 1930-35 at several soil and water conservation experiment stations has shown that soil loss from corn in a rotation with close-growing crops was less than from corn after corn, and similar results were obtained with cotton. Recent work at the Southern Piedmont Experiment Station at Watkinsville, Georgia, indicated that considerable reduction in soil loss and improvement in crop yields may be obtained by rotating cotton with other crops. Of special merit are (1) the 3-year rotation of cotton, oats-lespedeza, and lespedeza, and (2) the contour-balk system of cotton culture.

364. Delinting and Treating Cotton Seed in Georgia, 1938-41. By U. R. Gore. (*Ga. Sta. Circ.* 141, 1943. From *Exp. Sta. Rec.*, **89**, 1, July, 1943, p. 80.) Anthracnose-infested seed averaged an increase of 159 lb. seed cotton to the acre from Ceresan treatment. Machine delinting or reginning gave an increase of 167 lb., and reginning plus the chemical treatment an average increase of 250 lb. seed cotton per acre over the fuzzy, untreated seed. Planting of about 1 bushel of reginned seed per acre is recommended. Either New Improved Ceresan or Ceresan proved effective dusts for cottonseed, which may be treated at any convenient time and stored in a dry place until planted. It is good insurance any season to treat with organic mercury dusts. Being poisonous, treated seed should not be fed to stock or sold for oil. Seed heated in storage or damaged seed of low vitality should not be planted. Ample planting seed should be saved, since 2-year-old seed is practically disease-free and seed will be available should replanting be necessary.

365. La Cosecha Mecanica del Algodon. By R. G. Mata and R. A. Franchelli. (*Bull. No.* 62, Min. de Agr., Buenos Aires, Argentina, 1942.) Discusses the social and technical problems of the manual cotton picker, and also the problem of the mechanical cotton picker *v.* the rural worker. The results are described of experiments carried out in the United States in connection with the "Rust" cotton picker, and also of experiments during 1938 to 1942 in the United States and Argentina with the "International" model. The bulletin concludes with a discussion of the efficiency of the mechanical cotton pickers and the costs of installation.

[*Cf.* Abstr. **503**, Vol. XV. of this Review.]

366. Relationship of Certain Characteristics of Seed Cottons to Ginning. By W. S. Smith *et al.* (*J. Agr. Res.*, **66**, 6, 1943, p. 249.) Tests were conducted to ascertain whether certain American Upland cottons differed in respect to the time and energy required for ginning and, if so, to ascertain whether variations in certain seed-cotton properties were responsible for these differences. Planting of sixteen varieties in both 1936 and 1937, and a seventeenth in 1937 only, provided seed cotton for 184 test lots of 30 lb. each—3 for each variety in 1936 and 8 for each variety in 1937. Varieties were found to differ significantly in the time and net energy required to gin either 30 lb. of seed cotton or enough seed cotton to produce 10 lb. of lint. The larger and more fuzzy-seeded cottons required more time and energy to gin than the smaller and less fuzzy-seeded varieties. Apparently the large and fuzzy seeds are not discharged from the roll box during ginning as rapidly as smaller and

less fuzzy seeds. Varieties with a high lint percentage required less time and energy to gin 10 lb. of lint than varieties with low lint percentage. Lint percentage, however, had little effect upon the energy required to gin 30 lb. of seed cotton, but did affect the amount of time consumed, an increase in lint percentage tending to be accompanied by an increase in the amount of time required. The order of influence of the three seed-cotton properties follows. Time required to gin 30 lb. of seed cotton or 10 lb. of lint: (1) percentage of fuzz, (2) lint percentage, and (3) seed size. Net energy required to gin 30 lb. of seed cotton: (1) amount of fuzz, (2) seed size, and (3) lint percentage. Net energy required to gin 10 lb. of lint: (1) lint percentage, (2) amount of fuzz, and (3) seed size. Strength of fibre attachment to the seed had no effect upon the energy required to gin these particular cottons.

367. COTTON FEEDING EQUIPMENT CONTROL. By R. S. Baden. (*Instruments*, 1943, **16**, 35. From *Summ. Curr. Lit.*, xxiii., **10**, 1943, p. 267.) In the opening room of a southern textile mill (U.S.A.) cotton is removed from the bale and is fluffed up into a loose condition by special machinery. At times the cotton flowing into this machinery accumulates to such an extent that it overflows from the bin on to the floor, making it necessary to replace it manually in the feeder hopper. To shut down the feeding equipment a lever-actuated mercury switch was applied which would trip when the cotton in the bin reached a predetermined level. Since the mercury switch was being constantly tripped by the continuously rotating cotton in the bin, constant starting and stopping of the feeding machinery occurred while the bin was full. The problem was solved by supplementing the mercury switch with an electron tube type time delay relay (General Electric Co.). Once the mercury switch has initiated a shut-down period, this relay shuts down the cotton-feeding equipment for a pre-selected period, irrespective of the opening and closing of the mercury switch. After the time period has elapsed, the mercury switch can again start up the feeding equipment.

368. COTTON GIN AIR BLAST SYSTEM. Lummus Cotton Gin Co. (U.S.P. 2,275,755. From *J. Text. Inst.*, February, 1943, A69.) A cotton gin comprises a moto conveyor housing an air blast nozzle supplied from an air duct, a lint duct, and an induced air nozzle defined between the bottom of the conveyor housing and the top of the air duct, with means at its inner end for directing the induced air blast so as to divert foreign matter away from the lint duct.

369. COTTONSEED PROTEIN FOR ADHESIVES: CHEMICAL STUDIES. By C. Dorman. (*Miss. Farm Res.*, **5**, 9, 1942, p. 3. From *Exp. Sta. Rec.*, **88**, 2, 1943, p. 154.) Attention has been given to improving the methods of extraction and purification, obtaining manufacturing cost, and improving methods for using the protein as an adhesive for plywood. Some preliminary tests made on plywood glued with cottonseed protein are promising.

MACHINERY.

370. COTTON HARVESTING MACHINE. By C. E. Brown and A. M. Hanauer. (Pittsburgh. U.S.P. 2,302,180. From *Summ. Curr. Lit.*, xxiii., **10**, 1943, p. 266.) The claim is for the means by which the needles are driven on the picking cylinder of a harvesting machine. The needles are arranged in pairs along the cylinder.

371. COTTON HARVESTING MACHINE. International Harvester Co. (*Text. World*, 1943, **93**, 1, p. 104. From *Summ. Curr. Lit.*, xxiii., **10**, 1943, p. 265.) An improved cotton picker is described which takes the form of a machine attachment designed for mounting on a medium-sized tractor which provides the power for the picking operation. The picking element consists of a drum box housing two drums, each containing a series of vertical shafts. Mounted on these shafts are a large number of revolving spindles which gather the cotton. The spindles enter and retract in the cotton plants and take the cotton from the open bolls without disturbing the unopened bolls or otherwise injuring the plants. After the cotton fleece has been wound on the spindles it is removed by rubber strippers or doffers, conveyed by vacuum to a separating chamber, and then by air pressure, produced by fan equipment, to a large wire netting basket supported on a light framework on top of the machine, where it is held until ready to be dumped for conveying to the gin. When the tractor

is used with the picker, the high rear tractor wheels become the front wheels of the machine and the customary forward speeds of the tractor are available for travelling in the reverse direction. Field tests have shown that the picker harvests as much cotton in a day as can be picked by from 50 to 80 field hands.

372. Cotton Picking Machine. By T. A. Dicks. (Pittsburgh, U.S.P. 2,293,495. From *J. Text. Inst.*, May, 1943, A231.) Two sets of spindles move on endless bands so as to present a picking zone in which they move longitudinally with respect to the machine as it moves forward, and a blast of air is made to play on the cotton in this zone to remove foreign matter.

373. Cotton Picking Machine. By W. N. Smith. (Dallas, Texas, U.S.P. 2,279,598. From *J. Text. Inst.*, March, 1943, A118.) In a cotton picking machine having opposed reciprocating banks of picking needles, the needles are rotated by means of balls that work along helical grooves in their shanks.

[*Cf.* Abstr. **123**, Vol. XX. of this Review.]

374. Cotton Picking Spindle: Manufacture. (International Harvester Co., U.S.P. 2,290,222. From *J. Text. Inst.*, May, 1943, A231.) The claim is for a method of forming teasle-like teeth on the spiked spindles of a cotton-picking machine.

375. The Shirley Analyser. (*Text. Mnfr.*, lxix., April, 1943, p. 163.) This machine provides a means of obtaining definite figures concerning the proportions of clean cotton in any sample; it also enables spinners to obtain an idea of the capabilities of existing machinery on a particular class of material, and to determine the state of cleanliness of the product at any stage in the opening and cleaning processes up to and including carding. The use of streamline airflow is the prominent feature of the machine. The sample to be tested is fed to the taker-in revolving at high speed. A streamer plate underneath the taker-in regulates the air stream; the space below the taker-in is enclosed to form a settling chamber, the front partition extending to within a few inches of the lower face of the feed plate, thus forming an air inlet, and the back partition extending to a point close to the taker-in, providing an outlet from the chamber. A high-speed cage draws air partly from the front of the machine by way of the top of the settling chamber and partly from the open space at the delivery end of the machine. The exhaust duct of the fan is fitted with an adjustable air control valve of the diaphragm type by means of which the air flow can be correctly regulated. The delivery arrangement consists of a plate with its upper edge fitting closely to the cage surface of the dampered portion of the cover, the lower part extends inside the delivery box. The separation of the cotton and impurities takes place as the two travel with the air stream through the settling chamber. The heavy particles fall almost straight from the air stream to the tray. The cotton fibres, being more buoyant than the trash, are controlled by the air stream and carried along with it and out of the chamber on to the cage surface; the dust is sucked through the cage perforations; the cotton forms a layer on the cage surface and travels forward with the cage. When the foremost portion of the layer of cotton comes through the dampered portion of the cage it is pushed forward by the rear portion on to a delivery plate. An air stream admitted between the delivery plate and the cage helps to strip the layer from the cage; ultimately the cotton moves forward to the delivery box.

376. Some Textile Finishing Machines. By K. S. Laurie. (*Text Mnfr.*, lxix., April, May, 1943, pp. 176, 222.). A discussion of the following: the extended use of stainless steel; dye-jigger driving at constant speed; moisture removal by mechanical and by heat methods; tensionless drying; controlled cloth dimensions; automatic feeding of cloth; calendar developments. The paper is well furnished with photographs and diagrams of the machines described.

PESTS, DISEASES, AND INJURIES, AND THEIR CONTROL.

377. General Entomology. By S. W. Frost. (McGraw-Hill Book Co., New York and London, 1942. From *Exp. Sta. Rec.*, 88, 2, 1943, p. 218.) This work, intended as an advanced text, is presented in twenty-three chapters, each accompanied by a copious bibliography. Field keys to the immature forms of the orders

of insects exclusive of eggs and pupæ and to the common groups of lepidopterous and coleopterous larvæ, material on classifications of insects, and a list of general entomological texts and other important references, are given in an appendix.

378. Cotton Insect Pests: Control. By J. C. Gaines. (*Iowa Sta. Coll. J. Sci.*, 1942, **17**, p. 63. From *J. Text. Inst.*, May, 1943, A229.) A report is given of studies of the migration from other hosts to cotton, factors influencing the population on cotton plants, and methods of controlling the cotton flea-hopper, cotton bollworm, Mexican cotton boll weevil, and thrips.

379. Biological Control of Insects. By H. Nicol. (*Pelican Book*, No. A113. Penguin Books, Ltd., Harmondsworth, Mddx., 1943. Price 9d. From *Rev. App. Ent.*, xxxi., Ser. A, **4**, 1943, p. 162.) This is a popular account of the various ways in which natural enemies have been used for the control of insect pests, and of the investigations that were necessary before satisfactory results were obtained. Much of it is devoted to accounts of searches for and the liberation of parasites and insect and other predators, the examples being selected to illustrate the various techniques adopted in response to different problems, but other biological methods, such as the use of disease organisms, trap-crops and cultural measures that affect the interaction of the life-cycles of the pest and its food-plant or that alter the physical environment of the pest, are also discussed. Information is given on the ways in which insects are reared on a large scale for liberation, with some of the difficulties that must be overcome and the precautions that must be taken, and other chapters deal briefly with the structure and habits of insects, parasitism, and the influence exerted on biological control by the occurrence of different races among individual insect species. The complexity of the natural balance between a species and its environment and the consequences that may ensue when it is disturbed are discussed with reference to biological control, and a further chapter is devoted to the limitations to this method of control. Accounts are also given of the control of noxious weeds in Australia, South Africa, and elsewhere by means of insects.

380. California Cotton Insects. By G. L. Smith. (*Bull. Calif. Agr. Exp. Sta.*, 660. Berkeley, Calif., 1942. From *Rev. App. Ent.*, xxxi., Ser. A, **7**, 1943, p. 286.) The cultivation of cotton in California has increased rapidly of recent years, but in some districts insect pests have caused serious losses. Since comparatively little is known of cotton insects in this region, investigations on them were begun in 1935, and notes on their habits and control are given in this bulletin. The most important pest in the San Joaquin Valley is *Lygus hesperus*, Knight, which migrates to cotton from lucerne, weeds and other plants. Feeding by the nymphs and adults causes increased shedding of buds, flowers, and small bolls, a late crop, much of which is not mature when frost and rains occur, destruction of the seeds or reduction of their oil content or germinating power, and the production of abnormal bolls, weak and discoloured lint, or deformed plants. Methods to ascertain the presence of this Capsid in injurious numbers are described, and it is suggested that, to decrease damage, lucerne should be cut as often and as early as possible and weeds should be destroyed during April and May and in November. Of nine dusts tested, sulphur and Paris green (12 : 1) and sulphur and calcium arsenate (2 : 1) gave the greatest measure of control. Insecticides should not be applied between about sunrise and mid-afternoon, or the crop from that day's flowers will be lost. *Chlamydatus associatus*, Uhl., was much the most numerous of the other Capsids on cotton in the San Joaquin Valley, where burweeds (*Franseria* spp.) are its preferred food plants. Both nymphs and adults feed on the more succulent leaves, buds, flowers and stems, causing premature opening of bolls, weak fibre, and numerous undeveloped seeds. To prevent infestation burweeds should be burnt during autumn and winter to destroy the eggs, and the spring growth near cotton fields should be destroyed. Capsids of potential importance are *Psallus seriatus*, Reut., and *Creontiades femoralis*, Van. D. The Pentatomid, *Chlorochroa sayi*, Stal., is destructive in Imperial and Riverside counties, but is rarely injurious in the San Joaquin Valley. Over-wintering adults live about 8 months, and those that develop in spring and summer 2 or 3 months. The female lays an average of 150 eggs, in several clusters, the egg state varying from

5 days in July to 15 in spring. *Telenomus mesillæ*, Ckll., parasitizes an average of 48 per cent. of the eggs, and Tachinids about 3-5 per cent. of the adults. The bugs feed principally on seeds, and prefer plants other than cotton. Small numbers may do considerable damage, however, since they feed on many bolls in various stages of growth, causing shrivelled seeds and unpickable fibre, and sometimes disseminate fungi that cause boll rot. Preferred food plants should not be destroyed when the bolls are developing (in late June-October), but in early winter and spring and immediately after harvest in grain fields. The use of chemicals for control is difficult, but dusts of dinitro-o-cyclohezylphenol mixed with sulphur have shown promise; they should not be used after mid-August until more is known of their staining effect on cotton. Two other Pentatomids, *Thyanta custator*, F., which is usually scarce in California, and *Euschistus impictiventris*, Stal., which is of importance in Riverside and Imperial counties, cause similar but more severe injury, and the Pyrrhocorid, *Euryophthalmus convivus*, Stal., occasionally causes serious damage to cotton bolls. *Nysius minutus*, Uhl., sometimes kills or seriously injures seedling cotton. It breeds chiefly in grassland, and burning grass and weeds on the edges of fields, and frequent cultivation, irrigation, or flooding kill many of the nymphs. Sprays of 1 U.S. pint nicotine sulphate and 4-5 lb. fish-oil soap in 100 U.S. gals. water, or a dust of 25 per cent. calcium cyanide are also recommended. *Aphis gossypii*, Glov., is injurious in some districts, and *A. medicaginis*, Koch, destroys young seedlings but is seldom found on older cotton. *Trialeurodes pergandei*, Quaint., is the only Aleurodid of much importance in cotton fields. It develops on *Euphorbia ocellata*, which should be destroyed before July. *Hercothrips fasciatus*, Perg., feeds on cotton leaves and soft stems. With good coverage, dusts containing dinitro-o-cyclohexylphenol have given very good control. Another thrips, *Frankliniella occidentalis*, Perg., occurs on cotton throughout the season and stunts the plants. Several species of Lepidoptera are prevalent, and dusts or sprays of arsenicals or fluosilicates are recommended against most of them. The eggs of *Strymon melinus*, Hb., are laid singly on the succulent growth, and larvæ of this Lycænid destroy flower buds, small bolls, and occasionally succulent stems, and facilitate the introduction of boll rots. Over-wintering pupæ on dead plants can be killed by burning or ploughing under stalks and weeds. The larvæ of *Prodenia præfica*, Grote, usually migrate from lucerne to cotton, on which they destroy the leaves, stems, and bolls. Control measures include thorough cultivation to kill over-wintering pupæ, trapping the migrating larvæ by means of ditches, and the use of poison baits. *Heliothis armigera*, Hb., feeds on the bolls, and *Peridroma saucia*, Hb., and other cutworms occur in cottonseed trash and late bolls, feed on the leaves, and kill seedlings; the former should be controlled by ploughing and working the fields and cleaning up weeds in the spring, and the cutworms by poison baits. *Plusia (Autographa) californica*, Speyer, does not cause serious damage, but retards growth. Larvæ of *Celerio lineata*, F., which migrate from other plants, kill cotton seedlings by feeding on the leaves and stems, and can be kept out of fields by barrier ditches. *Laphygma exigua*, Hb., defoliates cotton plants in May and late July or August; and *Estigmene acræa*, Dru., causes injury in late summer. *Bucculatrix thurberiella*, Busck., defoliates the plants, and causes shedding of buds, flowers, and small bolls. *Diabrotica undecimpunctata*, Mannh. (*soror*, Lec.), is a minor pest, and feeds on the leaves, flowers, and buds. Germinating seeds and seedlings are attacked by the larvæ, and seedlings by the adults, of small Tenebrionids, of which *Blapstinus rufipes*, Casey, is the most important in the San Joaquin Valley. Control measures suggested are poison bran baits, heavy dusting of plants with lime, or light dusting with calcium arsenate or cryolite, and treatment of seed with organic mercury compounds. The large adults of the Tenebrionid genus *Eleodes* sometimes migrate from pasture and cause localized damage to cotton seedlings, which can be protected with barriers of straw or refuse that is later destroyed, steeply banked loose soil with post holes, ditches containing water or oil and water, or poison baits. The mites, *Tetranychus bimaculatus*, Harvey, and *T. telarius*, L., feed on the leaves of cotton that is well watered or growing near neglected ditches, roadsides, lucerne fields or deciduous fruit trees, and should be controlled by field sanitation or thorough treat-

ment with sulphur or dinitro-o-cyclohexylphenol dusts. Brief notes on insects of little importance on cotton in California, on predaceous insects commonly found on it in the San Joaquin Valley, and a list of important cotton pests that are not found in California, are appended.

381. CONTROL OF HEMIPTEROUS COTTON INSECTS BY THE USE OF DUSTS. J. R. Eyer and J. T. Medler. (*J. Econ. Ent.*, **35**, 5, 1942, p. 630. From *Rev. App. Ent.*, xxxi., Ser. A, **6**, 1943, p. 238.) Of the Rhynchota that injure cotton in the irrigated valleys of southern New Mexico, the most important are *Adelphocoris superbus*, Uhl., and species of the genera *Lygus* and *Chlorochroa*. In a randomized block experiment at State College in 1941 substantial increases in yield of seed cotton were obtained with dusts of Paris green and sulphur and calcium arsenate and sulphur, but not with sulphur alone. These arsenical-sulphur combinations also produced relatively high mortalities of *C. sayi*, Stal., *L. hesperus*, Knight, and *A. superbus* in large field cages; sulphur alone was again ineffective.

382. MADRAS: *Thevetia neriifolia* AS A CONTACT INSECTICIDE. By C. Vijayaraghavan. (*Ind. Frmg.*, iii., **12**, 1942, p. 650.) Investigations carried out by the Government Entomologist to determine whether the insecticides that are now difficult to obtain could effectively be substituted by any of the locally available plant poisons have resulted in the discovery of a powerful contact insecticide in the kernels of *Thevetia neriifolia*. A native of South America and the West Indies, this plant has been grown in India for many years. In South India it is commonly grown as a hedge plant. Aqueous extracts of the kernel prepared by mashing or grinding and then steeping in cold water for 24 hours have been found to be highly toxic against a wide range of insects. Optimum strengths for soft- and hard-bodied insects have been studied. A strength of $\frac{1}{4}$ oz. of the kernel in 1 gal. of water is sufficient to kill plant lice, thrips and leaf hoppers. Half an ounce in 1 gal. of water is required against the defoliating caterpillars like the moringa hairy caterpillar and the castor semi-looper, while 1 oz. of the kernel in 1 gal. of water is necessary for the control of mealy bugs and scale insects. To obtain the maximum effect, the addition of soap equal in quantity to that of the kernel used is necessary. Plants sprayed by aqueous extracts of the kernel have been found to be immune from insect attack for short periods. No injury is done to the foliage when the concentration is less than 1 oz. per gal. In addition to the kernel, the cake and oil of *Thevetia neriifolia* possess toxicity of varying degrees. *Thevetia* oil has been found to act as a deterrent against termite attack.

383. LA ACCION TOXICA DEL SELENIO. By J. E. Wille. (*Bol. Direc. Agr. Ganad. Peru* 14 (1940-41), Nos. 36-43, p. 241, Lima, 1942. From *Rev. App. Ent.*, xxxi., Ser. A, **3**, 1943, p. 120.) An account is given of experiments in Peru on the effect on *Anomis texana*, Ril., and *Dysdercus ruficollis*, L., of adding selenium to the soil in which cotton is grown. Cotton seedlings were planted in plots containing soil to which sodium selenate was added at rates of approximately 5, 10, 20, 50, and 100 parts selenium per million. The plants that received the two highest dosages died prematurely, and those that received the third were stunted. The others grew normally. The plants of the three groups that survived were infested with larvæ of *Anomis* at the beginning of February, when flowering was beginning, and with nymphs and adults of *Dysdercus* in mid-March, when bolls were present. The percentage mortalities for the three treatments (5, 10, and 20 parts selenium) were 90, 100, and 100 in 13, 11, and 8 days for *Anomis* and 30, 73, and 37 in 13 days for *Dysdercus*. The larvæ of *Anomis* that survived pupated but the pupæ died. The surviving bugs gave rise to viable eggs. In further tests, neither species showed a preference for untreated over treated plants. When seeds from plants treated at the three rates were infested with nymphs and adults of *Dysdercus*, the percentage mortalities were 18, 70, and 82 in 15, 30, and 50 days for the lowest rate, 55, 90, and 100 in 15, 30, and 41 days for the next, and 65, 92, and 97 in 15, 30, and 50 days for the highest. No eggs were laid. It is concluded that the treatment is unsatisfactory against both species, for though the mortality of *Anomis* is high, the larvæ survive long enough to cause considerable damage.

384. Relation of Fertilizers to the Development of the Cotton Aphid. By R. L. McGarr. (*J. Econ. Ent.*, **35**, 4, 1942, p. 482. From *Rev. App. Ent.*, xxxi., Ser. A, **5**, 1943, p. 185.) Observations having indicated that the use of nitrogenous fertilizers or nitrogen-producing crops on land planted to cotton stimulates the development of *Aphis gossypii*, Glov., when calcium arsenate is used against other insects, an experiment was carried out in Mississippi in 1941, on land on which no fertilizer had been used in recent years, to obtain more definite information on the relation of nitrogen in the fertilizer to the abundance of the aphid. Infestations on cotton after treatment with fertilizers containing different amounts of nitrogen, but fairly constant amounts of phosphoric acid and potash, applied at the rate of 600 lb. per acre in April, just before planting, and with calcium arsenate dust, applied at the rate of about 6 lb. per acre at approximately 5-day intervals from the end of June, when the cotton was beginning to flower, were compared with those following calcium arsenate dust alone, fertilizer alone, and no treatment; six effective applications of calcium arsenate were made. Records made on the day before the first dust was applied and at approximately weekly intervals showed that aphid populations increased slowly in all plots for about a month and then very rapidly in the dusted plots, and that infestation by the boll weevil (*Anthonomus grandis*, Boh.) was significantly higher in undusted than in dusted plots. The nitrogenous fertilizer caused no appreciable increase in aphid populations when calcium arsenate was not used, but the increase caused by the latter was greater when fertilizers were used, the average number of aphids per square inch leaf surface for the four last examinations being 6·75, 8·34, 8·88, and 9·76 when the dust and fertilizers containing 0, 2·29, 4·08, and 6·53 per cent. nitrogen were used, 6·05 when the arsenate only was applied, 0·91 on untreated land, and 1·07 on land treated with fertilizer (6·53 per cent. nitrogen) only.

385. Notes on the Control of Cotton Aphids. By G. L. Smith *et al.* (*J. Econ. Ent.*, **35**, 4, 1942, p. 598. From *Rev. App. Ent.*, xxxi., Ser. A, **5**, 1943, p. 199.) Gives the results of preliminary tests made in Louisiana in 1941 to determine the effect of nicotine sulphate and free nicotine in different concentrations and with different carriers in controlling aphis on cotton. Dusts containing 3 per cent. nicotine (prepared by mixing 40 per cent. nicotine sulphate solution with lime or a 10 per cent. free nicotine dust with lime, clay or tobacco dust) applied on July 30 to a heavily infested field gave about 66 per cent. control 8 days after dusting in all cases but one (free nicotine and lime) in which a light dosage was used. Dusts containing free nicotine gave excellent control when applied on August 20 at the rate of 13·5-15 lb. per acre, but that containing nicotine sulphate applied at only 6·75 lb. per acre was less effective. In a third test the nicotine sulphate dust, applied on August 22, gave almost complete control in a heavily infested field in three days, and considerable reduction to the south of the dusted area, owing to drifting; the dust was more effective when applied when dew was forming than earlier when there was more drift.

386. Notes on the Effect of Arsenicals upon the Cotton Aphid, Predators, and Other Insects. By G. L. Smith *et al.* (*J. Econ. Ent.*, **35**, 4, 1942, p. 596. From *Rev. App. Ent.*, xxxi., Ser. A, **5**, 1943, p. 198.) Observations in cotton fields in Louisiana in 1941 showed that the cotton aphid was scarce and Coccinellids abundant in fields that had not been dusted for the control of boll weevil, while the aphid was very numerous in most of the dusted fields, and there were few Coccinellids after July 1. To find the effect of calcium arsenate dusts on these and other insects a field at least half a mile from any dusted one was given five effective applications of calcium arsenate containing 10 per cent. Paris green between July 23 and August 18, and one of two that were near dusted fields containing severe aphid infestations when the tests were begum was given three of a heavy calcium arsenate, containing a high percentage of water-soluble arsenic pentoxide, and clay (3 : 1) between August 5 and 16, while the other received four of calcium arsenate containing 1 per cent. free nicotine between August 4 and 18. Parts of each field were left untreated, and counts of the insect populations were made before dusting began and at weekly intervals throughout the experimental period. At the end of

the treatment the aphid population was three and four times as great in dusted as in undusted parts of the first two fields, but only slightly greater in the third. Considerably fewer Coccinellids and Chrysopid larvæ, but more boll weevils, were taken in dusted than in undusted areas, the reduction of Coccinellid larvæ being greater than that of the adults. The numbers of Capsids were reduced in the first field, possibly owing to natural migration, but probably to the Paris green. The fact that weevils were more numerous in the dusted parts of all fields was probably due to migration in search of food, since dense populations destroyed most of the food in undusted areas during August, whereas there was an increase of squares and blooms in the dusted areas during the early part of the experimental period.

387. ROTENONE IN COMBINATION WITH CALCIUM ARSENATE FOR COTTON APHID CONTROL. By C. F. Rainwater. (*J. Econ. Ent.*, **35**, 4, 1942, p. 500. From *Rev. App. Ent.*, xxxi., Ser. A, **5**, 1943, p. 188.) A discussion of the control of *Aphis gossypii*, Glov., and the increase in yield of seed cotton obtained under a wide variety of conditions in South Carolina, Georgia, Florida, Mississippi, Louisiana, and Texas, when ground derris root was added to calcium arsenate, applied against boll weevil, to give rotenone contents of 0·1-0·5 per cent. It was found that calcium arsenate with 0·5 per cent. rotenone was effective in keeping the aphid population at or below that in untreated plots, and caused a significant increase in yield over plots treated with calcium arsenate alone under conditions of heavy boll weevil injury. This mixture gave insignificantly greater increases in yield and fewer aphids than one of equal quantities of calcium arsenate and sulphur containing 0·25 per cent. rotenone, and usually significantly higher yields than calcium arsenate alone, whereas the other mixture did not. Smaller proportions of rotenone in either mixture were not very effective in preventing increase of aphids. Records obtained in Louisiana showed that cubé and timbo were as effective as derris as sources of rotenone, and those from South Carolina that diatomaceous earth, clay, pyrophyllite and walnut-shell flour were as effective as sulphur as diluents for calcium arsenate and rotenone. Where control of boll weevil was not a factor, the plots treated with the mixtures of calcium arsenate and rotenone were comparable with the untreated plots in both aphid population and yield, and where it was, these mixtures gave highly significant increases in yield over the control plots and significant increases over the calcium arsenate plots.

388. EFFECT OF BOLL WEEVIL AND COTTON APHID CONTROL ON YIELD AS SHOWN IN A FACTORIAL EXPERIMENT IN 1941. By R. C. Gaines. (*J. Econ. Ent.*, **35**, 4, 1942, p. 493. From *Rev. App. Ent.*, xxxi., Ser. A, **5**, 1943, p. 187.) Factorial experiments to determine the comparative effect on infestation and yield of cotton of treatment with calcium arsenate dust for the control of boll weevil, and with nicotine against aphis, and a combination of the two treatments, were continued in South Carolina, Florida, Louisiana, and Texas in 1941. The nicotine was applied in a spray at the rate of about 2 lb. nicotine sulphate (40 per cent.) per 100 U.S. gals. water in Florida, and in a dust of tobacco and lime (9 : 1) to which the nicotine sulphate was added to give a nicotine content of approximately 3 per cent. in the other States. Comparison of the results from treatment with calcium arsenate or calcium arsenate and nicotine with those from no treatment or treatment with nicotine showed that the arsenate caused significant reductions in weevil infestation in all localities, significant increases in numbers of aphids in all localities except in Louisiana, and significant increases in yield in all except Florida and Louisiana, the increase in yield in Texas being partly due to the control of the bollworm (*Heliothis armigera*, Hb.). Similar comparisons showed that nicotine gave significant reductions in aphids, except in Louisiana, and significant increases in yield in Florida and Louisiana, and that calcium arsenate and nicotine interacted to cause significant reductions in aphids at all localities and a significant increase in yield in Louisiana. Calcium arsenate gave significant increases in yield over the control plots of 391, 64, and 45 per cent. in South Carolina and Louisiana, where weevil infestation was heavy, and Texas, where it was intermediate; nicotine gave non-significant increases in Florida, Louisiana, and Texas, and calcium arsenate and nicotine together gave

significant increases of 418, 128, and 41 per cent. in South Carolina, Louisiana and Texas, and increases that were not significant in another experiment in Louisiana and in Florida. Calcium arsenate and nicotine gave significant increases in yield over calcium arsenate alone of 78 and 39 per cent. in Florida and Louisiana and insignificant increases in South Carolina and in another experiment in Louisiana.

[*Cf.* Abstr. **151**, Vol. XX. of this Review.]

389. CALCIUM ARSENATE WITH AND WITHOUT APHICIDES FOR CONTROL OF BOLL WEEVIL AND COTTON APHID. By M. T. Young *et al.* (*J. Econ. Ent.*, **35**, 4, 1942, p. 490. From *Rev. App. Ent.*, xxxi., Ser. A, **5**, 1943, p. 186.) In experiments against *Anthonomus grandis*, Boh. and *Aphis gossypii*, Glov., on cotton in Louisiana in 1941, undiluted calcium arsenate, zinc-safened calcium arsenate (3·4 per cent. zinc oxide, *p*H 10·5), mixtures of calcium arsenate and derris, cubé or timbo (0·5 per cent. rotenone) and calcium arsenate mixed with nicotine sulphate solution to give nicotine contents of 0·5, 1, and 2 per cent., or with a dust containing free nicotine to give 1 per cent. nicotine, were equally effective against the weevil, giving significant control. Calcium arsenate and zinc-safened calcium arsenate both caused significant increases in the numbers of aphids and resulted in no increase in yield over the control plots, but the mixtures of calcium arsenate with derris, cubé and timbo, which were equally effective, kept the aphid population at about that in untreated plots, and caused significant increases in yield when compared with calcium arsenate alone. Calcium arsenate and 1 per cent. nicotine from nicotine sulphate or free nicotine gave better control of aphids and higher yields than calcium arsenate with rotenone, and calcium arsenate with nicotine sulphate (1 per cent. nicotine) was more effective against the aphids than that containing free nicotine. A mixture of calcium arsenate and 0·5 per cent. nicotine applied in late afternoon gave better aphid control and a higher yield than a similar mixture or one of calcium arsenate and rotenone applied in the early morning. Alternate applications of calcium arsenate and a mixture of calcium arsenate and 2 per cent. nicotine gave much more effective control of aphids and higher yields than alternate applications of calcium arsenate and mixtures containing 1 or 0·5 per cent. nicotine.

390. BLACK-HEADED CRICKET IN BALUCHISTAN. By N. A. Janjua. (*Ind. Frmg.*, iii., **11**, 1942, p. 606.) The black-headed cricket (*Gryllulus domesticus*, Linn.), locally known as *tid*, is a pest of first importance in the Usta area (Sibi district). It appears in swarms at night and attacks cotton, *jowar*, oil-seeds, etc., and remains active from April to July. A 3-year scheme sanctioned by the Indian Central Cotton Committee was put into operation in April, 1942, and control work was organized in the area and on the bridges of the Khirtar Canal. Trenches and barriers were set up on the bridges to check the influx of the pest from the Kachli district of Kalat State, and control was also effected by means of a poison-bait consisting of rice bran, sodium fluosilicate, and molasses.

391. *Heliothis obsoleta* F. By F. Manolache. (*Viata agric.*, **31**, 1940, p. 355. In Rumanian. From *Rev. App. Ent.*, xxxi., Ser. A, **5**, 1943, p. 227.) *Heliothis armigera*, Hb. (*obsoleta* F.) is recorded from cotton, tomato, tobacco, and soy bean in Rumania, and a list is given of parasites of the eggs and larvæ.

392. AN INTERNATIONAL ANTI-LOCUST CAMPAIGN. By B. P. Uvarov. (*Nature*, 9/1/43, p. 51.) Details are given of practical schemes for the preventive control of the three species of African locust: the Red Locust (*Nomadacris septemfasciata*); Migratory Locust (*Locusta migratoria migratorioides*); and the Desert Locust (*Schistocerca gregaria*).

393. SOME RESULTS OF STUDIES ON THE DESERT LOCUST (*Schistocerca gregaria*, FORSK.) IN INDIA. By Y. Ramchandra Rao. (*Bull. Ent. Res.*, **33**, 4, 1942, p. 241. From *Rev. App. Ent.*, xxxi., Ser. A, **4**, 1943, p. 156.) This paper contains the most important of the results of the author's investigations on *Schistocerca gregaria*, Forsk., in India in 1931-39. The life cycle and migrations of phase *solitaria* were studied by means of regional surveys, in which all areas in which this phase occurs were visited at least once in every 2 or 3 months, and by intensive continuous observations throughout the year at selected spots. The surveys carried out over a period

of 9 years have shown that the bionomics of phase *solitaria* are strikingly correlated with seasonal weather changes. The annual cycle, characterized by migrations between areas with winter, spring, and summer rainfall, is described. Comparison of the annual cycle and migrations of phase *solitaria* with those of phase *gregaria* in 1926-31, which are briefly described, show that there is a remarkable parallelism between them. The discovery that phase *solitaria* can migrate over large distances, and that its population density in breeding areas is marked by continual fluctuations due not only to local breeding but also to immigration and emigration, has modified the original conception of the origin of outbreaks by the building up of large populations within given outbreak areas. Such building up is now visualized as the result of breeding under conditions favouring concentrations in one or more areas that may be widely separated but are connected by seasonal migrations, and the way in which outbreaks are thus built up in India is described.

394. *Orius insidiosus*, A PREDATOR ON COTTON INSECTS IN WESTERN TEXAS. By W. S. McGregor. (*J. Econ. Ent.*, **35**, 3, 1942, p. 454. From *Rev. App. Ent.*, xxxi., Ser. A, **3**, 1943, p. 113.) In western Texas, *Orius insidiosus*, Say, sometimes develops such large populations that it gives effective control of injurious insects, particularly those that attack cotton. During early June, 1938, large numbers of nymphs of this Anthocorid reduced infestation by nymphs of *Psallus seriatus*, Reut., in a cotton field from an average of 86 per 100 plants to 9 per 100 in 3 days, and in late July both nymphs and adults were observed preying on a heavy infestation of aphids, and on recently hatched larvæ of *Heliothis armigera*, Hb., that were feeding on the seed heads in an adjacent field of grain sorghum. When the sorghum was cut for silage shortly after, a severe outbreak of *Alabama argillacea*, Hb., was attacked by *Orius* nymphs, which destroyed over 90 per cent. of the pupæ and over 70 per cent. of the grown larvæ; as a result, infestation by the second generation of the moth was insignificant, though no control measures had been applied. In September, 1941, on cotton that was severely damaged by the first generation of *A. argillacea*, an average of 16 per cent. of the pupæ were dead, and a number of prepupæ were being attacked by *Orius*, which rendered control measures against the second generation unnecessary although the weather was favourable for reinfestation.

395. INDIA: REPORT OF THE IMPERIAL ENTOMOLOGIST. By H. S. Pruthi. (*Sci. Rpt. Agr. Res. Inst.*, New Delhi, 1940-41, p. 57.) Ecological work on the spotted bollworm of cotton (*Earias fabia*) and its parasite *Microbracon greeni* var. *lefroyi* was continued. Studies on the incidence of this pest and its parasite during the hottest and driest period of the year, May and June, indicated that the population of the bollworm was fairly high while the parasite was very rare. With the first showers of rain at the end of June and consequent fall in temperature and rise in relative humidity, the position was reversed—the incidence of the parasite began to rise and that of the host to decline.

In studies of fatal temperatures for the pink bollworm, an exposure of cottonseed for 24 hours to 45° C. was fatal to the larvæ when saturation deficiency of air was 3-14 mm. but not when the saturation deficiency was 32 mm. Mortality was higher among larvæ in American seed than in *desi* seed. Viability of cotton seed was not materially affected by exposure for about 20 minutes to 65° C. or 7 minnutes to 80°C

396. ÉTUDE DE L'ACARIOSE DU COTONNIER, CAUSÉE PAR *Hemitarsonemus latus* (BANKS) AU CONGO BELGE. By J. M. Vrydagh. (*Publ. Inst. Étude agron. Congo Belge*, Ser. Sci. No. 28, Yangambi, 1942. Price Fr. 20. From *Rev. App. Ent.*, xxxi., Ser. A, **7**, 1943, p. 297.) *Tarsonemus* (*Hemitarsonemus*) *latus*, Banks, all stages of which are described, was found on cotton in the Belgian Congo where it had not previously been recorded, in 1936, and observations in 1939 and 1941 showed that infestation was widespread in the northern savannah districts. It was also found infesting *Capsicum annuum*, rubber, castor, sweet potato, and other plants, and a list of its recorded food-plants is included. On cotton the mites live chiefly on the lower surfaces of the leaves and feed on the epidermis. Infested leaves curl, develop brown patches, and split, but do not drop prematurely. Infested cotton plants have unusually long internodes, develop few bolls, and are practically sterile. The injury

is similar to the leaf-curl of cotton recorded by Jones and Mason in Nigeria, and to that caused by *T. latus* and described by Hambleton in Brazil. The life-cycle lasted 4½ days in the laboratory at 24° C. (75·2° F.). The females oviposited on the lower surfaces of the leaves, beginning mostly 1-2 days after emergence, and deposited 6-33 eggs at the average rate of 3 a day. Pairing did not influence oviposition, but eggs laid by unfertilized females gave rise to males only. The process of pairing is described, and the significance of the habit of the males of transporting the nymphs is discussed. The mite is favoured by wet weather with abundant soil moisture and is rare during the dry season.

397. Termites in East Africa. IV. Termites and Buildings. By W. V. Harris. (*E. Afr. Agr. Jour.*, January, 1943, p. 146.) Describes the damage caused by Mound-building, Subterranean, and Dry-wood Termites to buildings, and the control measures recommended.

[*Cf.* Abstrs. **170, 415**, Vol. XVIII. of this Review.)

398. Ecological Relations of Plants with Ants and Termites. By J. C. T. Uphof. (*Bot. Rev.*, viii., **9**, 1942, p. 563. From *Rev. App. Mycol.*, xxii., **4**, 1943, p. 136.) Among the aspects included in this survey of the ecological relations of plants with ants and termites may be mentioned " the fungus-growing habit among ants and termites," " ant-fungi," and " termite-fungi." The bibliography of 193 titles comprises a number dealing with the mycological side of the symbiotic connection between fungi and insects.

399. The Nature and Extent of Damage Caused by *Bemisia gossypiperda*, M. and L. The White Fly of Cotton in the Punjab. By M. A. Husain and K. N. Trehan. (*Ind. J. Agr. Sci.*, xii., **6**, 1942, p. 793.) In the absence of any mechanical injury to the plant tissues, the effects of white-fly attack were studied in relation to the physiological changes in the plant, its rate of growth and its reproductive activities. The percentage of moisture is relatively higher in the uninfested plants with a corresponding increase of dry matter in the infested ones. Healthy plants show a lower C/N ratio—a condition that has been shown to stimulate the vegetative and reproductive growth of the plant. Nitrogen is higher in the foliage of the uninfested cotton plants till the middle of August, after which it may rise in the foliage of the infested plants. However, it is significantly higher in the bolls of the uninfested plants than in those of the infested ones. A much higher percentage of nitrogen, ash and fat is transported from the vegetative to the reproductive organs in the uninfested plants. Reduction of bolls on the infested plants may be the result of some dislocation in the carbohydrate and protein balance. The total dry matter produced by the uninfested plants as a result of their growth far exceeds that produced by the infested ones, and on an average may extend to about 40 per cent. Thus the vegetative and reproductive growths are superior in the case of uninfested plants. During the period of severe infestation the vegetative growth is checked and in severe cases of attack may be almost stopped. The boll formation increases as the intensity of attack decreases, while the shedding and bad opening of the bolls correspond with the increase in attack. The bolls produced by the uninfested plants are well developed and yield a maximum weight of *kapas*. The severity of infestation, particularly when it appears late in the growing season, lowers the yield of lint and affects the plant more adversely in all respects. *B. gossypiperda* has not been found responsible for the transmission of the " smalling " disease in cottons.

400. Some Factors Relating to Colonization, Recovery, and Establishment of Insect Parasites. By C. P. Clausen. (*Proc. 6th Pacif. Sci. Congr.*, 1939, **4**, Calif., 1940, p. 421. From *Rev. App. Ent.*, xxxi., Ser. A, **7**, 1943, p. 293.) The author discusses, with special reference to the development of method, some of the problems encountered in the course of work on the introduction of parasites and predators against insect pests. They include the question of whether stocks for liberation shall be imported or reared in the laboratory, and if the latter, the selection of suitable breeding hosts, the size and spacing of colonies, and the period for which attempts to establish a given species should be continued. Considerable influence is exerted on establishment by the conditions of light and temperature at the time of

release. Adults sometimes disperse widely and quickly when liberated in bright sunlight and at relatively high temperatures, thus reducing opportunities for mating among the individuals released and among their progeny and perhaps removing a large proportion of the colony from a small favourable area to others that are unfavourable. W. A. Baker has observed the immediate death of adults of certain parasites of the European corn borer (*Pyrausta nubilalis*, Hb.), notably *Macrocentrus gifuensis*, Ashm., when released under these conditions in the United States. This is attributed to physical shock, caused by the sudden transition from the moderate temperatures (45-60° F.) and diffused light or darkness in which the parasites are kept before release to temperatures often exceeding 100° F. and intense sunlight. Where species released under such conditions have survived and become established, it is probable that still more satisfactory results would be obtained if they were released under more favourable conditions. To overcome these difficulties it is suggested that releases should be made at dusk or at dawn, when activity would be reduced by the cool temperatures and dim light, and the tendency to disperse checked. Further advantages derived from liberations at dusk are the opportunity afforded by the night for the insects to recover from the effects of transport and to become accustomed to their new surroundings and for gradual adjustment to increasing light and temperature.

401. A NOTE ON TECHNIQUE FOR ROUTINE EXAMINATIONS OF PARASITIC HYMENOPTEROUS LARVÆ. By G. C. Ullyett and J. S. van der Merwe. (*J. Ent. Soc. S. Afr.*, **5**, p. 147, Pretoria, 1942. From *Rev. App. Ent.*, xxxi., Ser. A, **5**, 1943, p. 221.) In view of the importance in practical biological control of the routine identification of the larvæ of parasitic Hymenoptera, a simple and quick technique for the preparation of specimens for microscopic examination is essential. A description is given of a technique developed by the authors, and its advantages over other methods are discussed.

402. METHODS OF REARING THE PINK BOLLWORM PARASITES *Chelonus* AND *Microbracon*. By L. W. Noble and W. T. Hunt. (*J. Econ. Ent.*, **35**, 4, 1942, p. 597. From *Rev. App. Ent.*, xxxi., Ser. A, **5**, 1943, p. 199.) The authors discuss the difficulty of rearing introduced parasites of pink bollworm in the laboratory in Texas, largely owing to the short period during which the host is available. Studies of other possible hosts led to the selection of *Ephestia kuehniella*, Zell., which can be reared easily on dry food, and gives satisfactory results with most species of *Chelonus* and *Microbracon*; it has been used since 1935 for rearing bollworm parasites of these genera, with outstanding results in the case of *Chelonus*. For breeding *C. blackburni*, Cam., and *C. pectinophoræ*, Cushm., the eggs of *Ephestia* are obtained in large numbers by adaptations of earlier methods, scattered over a disk of moist absorbent paper pressed into a petri dish and exposed to the parasites in a cloth-covered cage for 24 hours. Although less satisfactory than pink bollworm (*Platyedra gossypiella*), *Ephestia* has been used for rearing *M. kirkpatricki*, Wlkn., *M. nigrorufum*, Cushm. and *M. mellitor*, Say. Since these Braconids will not oviposit in exposed larvæ, a method was developed by which the hosts were paralysed by immersion in hot water (7 minutes at 120° F. for *Platyedra*; 1 minute at 116° F. for *Ephestia*) and separated from the parasites by a cloth, but in view of the danger of killing the host larvæ, which would then decay before the parasite finished its development, this has been superseded by one in which the larvæ are confined between a heavy paper and a loosely woven cloth, bound in an embroidery hoop; all the parasite larvæ attach their cocoons to the paper, which is removed and cleaned of the remains of the hosts as soon as the cocoons are formed, to reduce the danger of infestation by mites.

403. HOST LIST OF THE PARASITIC FUNGI OF UGANDA. Pt. I. By C. G. Hansford. (*E. Afr. Agr. Jour.*, April, 1943, p. 248.) The host list published in 1937-38 contained a considerable number of fungi of which the names have now been revised in the light of more recent research and comparison with similar fungi in other parts of the world, with the result that that list is now out of date. Collection has been continued during the interval, and a considerable number of new records are included in the present list.

404. AN INTRODUCTION TO INDUSTRIAL MYCOLOGY. By G. Smith. (Reviewed *J. Text. Inst.*, February, 1943, p. 41.) In the second edition of this useful book there would appear to be a reduction in size from 302 to 250 pages, but this is due to both sides of the paper being used in the printing of the 136 illustrations. The text has actually been expanded, notably by the inclusion of a separate chapter devoted to the yeasts. The only other major change is the provision of a new key to the classification of the large family of Hyphomycetales. References to work published since the first edition appeared include notes on the anti-bacterial substances produced by moulds, of which penicillin is one of the most important.

[*Cf.* Abstr. **304**, Vol. XVI. of this Review.]

405. LIST OF ECONOMIC PLANT DISEASES IN THE ANGLO-EGYPTIAN SUDAN. By A. S. Boughey. (*E. Afr. Agr. Jour.*, January, 1943, p. 188.) "This publication will be of particular interest to agriculturists in the Sudan, and is a useful addition to our information on plant disease distribution in Africa. Besides many agricultural and horticultural crops, some weeds and ornamentals which may serve as alternative hosts for crop diseases are also listed. The booklet is compact in size and is published by the Dept. of Agriculture and Forests, Khartoum, Sudan."

406. THE NATURE AND PREVENTION OF PLANT DISEASES. By K. S. Chester. (Blakiston Co., Philadelphia, 1942. From *Exp. Sta. Rec.*, **88**, 2, 1943, p. 202.) "The subject-matter of this book and the manner of treatment have been largely dictated by the needs of students to whom an elementary course in plant pathology is a part of the background fitting them for useful work in agriculture. . . . The book has the dual purpose of introducing the student to the essential features of the science, as exemplified in important diseases of our leading crops, and of providing him with a work to which he may refer for detailed and specific directions on plant disease control." Diseases of major importance to agriculture in the southern United States are given special attention.

407. NOTES ON SOME DISEASES OF FIELD CROPS, VEGETABLES AND FRUITS AT THE IMPERIAL COLLEGE OF TROPICAL AGRICULTURE. By R. E. D. Baker. (*Trop. Agr.*, March, 1943, p. 59.) The following cotton diseases may usually be found but not to any serious extent: *Glomerella* (*Colletotrichum*) *gossypii* (Anthracnose); *Bacterium malvacearum* (angular leafspot, blackarm); *Ramularia areola* (mildew); *Cerotelium* (*Kuehneola*) *gossypii* (rust); *Alternaria macrospora* (leafspot); *Nematospora gossypii* (internal boll disease); and root rots, usually caused by members of the genus *Rhizoctonia*, occur sporadically in wet weather.

408. DISSEMINATION OF FUNGUS SPORES IN AIR. By P. H. Gregory. (*Trans. Brit. Mycol. Soc.*, xxv., **4**, 1942, p. 442. From *Rev. App. Mycol.*, xxii., **5**, 1943, p. 173.) Investigations on the air transmission of fungus pathogens to new areas are mostly concerned with how far and how high spores are transported by air currents. Comparatively little is recorded of the number of spores deposited within short distances. Under field conditions the relation between degree of infection and distance from an infected field may be important, and from the fact that printed observations on a number of diseases are in agreement with Stepanoff's formula it is thought that dissemination of spores in air may be measured quantitatively.

409. A NEW CULTURE MEDIUM FOR THE GROWTH OF *Chætomium globosum*. By W. G. Chace and G. S. Urlaub. (*Amer. Dyestuff Rptr.*, **31**, 14, 1942, p. 331. From *Exp. Sta. Rec.*, **88**, 2, 1943, p. 287.) This investigation was directed toward developing a medium better suited to the growth of *C. globosum* than the Czapek agar in general use, in order that a large quantity of the spores might be available for the accepted testing of mildew-proofed fabrics. The medium finally developed used finely divided cellulose (mechanically disintegrated) as a source of carbon and KH_2PO_4 as a buffer. It is claimed for the proposed medium that (1) the time of sporing is cut to 4 or 5 days, (2) the quantity of spores produced is many times that obtainable on Czapek agar, (3) growth of common air-borne contaminants is greatly reduced if not entirely eliminated, and (4) the work of preparation of the medium is not much greater than with other culture media.

410. Textile Mildews. By E. Hardy. (*Silk and Rayon*, xvi., **8**, 1942, p. 468. From *Rev. App. Mycol.*, xxii., **4**, 1943, p. 135.) Fresh samples of raw cotton are stated to have yielded from 4,000,000 to 58,000,000 bacteria and 120,000 to 400,000 moulds per gm., mostly of the soil types which attack cellulose and starch and survive the textile-manufacturing processes in the form of spores. Cotton deterioration in storage is caused by species of *Stachybotrys*, and raw cotton (especially Indian) is the source of much of this infection of cloth. The first sign of mildew is usually a characteristic musty smell, followed by the appearance of greenish, brownish, reddish, yellowish, purplish, or blackish spots due to the presence of *Penicillium chrysogenum*, *Aspergillus niger*, *A. versicolor*, *A. wentii*, *Fusarium* spp. and *Mucor* spp., respectively. Acidity stains are produced on dyed material by *A. fumigatus*, *A. niger*, *P. chrysogenum*, and *Rhizopus arrhizus*. Cellulose decomposing species responsible for tendering of cotton include the foregoing, *A. glaucus*, *A. versicolor*, and *A. terreus*, while *A. brunneofuscus*, *A. clavatus*, and *A. fumigatus* will attack the pure cellulose fibres of cotton under suitable moisture conditions and in the presence of inorganic salts. Well-washed wool requires an atmospheric humidity of 97 per cent. to encourage mildew, but a far lower concentration permits its growth in the case of an impure commercial product, while cotton is also susceptible—*e.g.*, to *A. glaucus*, at a point much farther removed from saturation. Most mildews thrive at 25° C., while *A. fumigatus* continues to grow at 37° C. The *Penicillium* and *Mucor* spp. generally flourish at lower temperatures than the *Aspergilli*, and are thus less prevalent on tropical material. Shirlan is stated to be the most efficient antiseptic at present known to the cotton industry. Some of the most effective of the 135 chemical treatments devised by the United States Dept. of Agriculture for the mildew-proofing of cotton fabrics are a cation (plus charge) active softener, followed by a synthetic resin, methyl methacrylate; acetone, formalin, and soda ash; wax and aluminium acetate; catechu copper sulphate and ammonium hydroxide; copper propionyl acetate; and cadmium chloride followed by borax. Sodium pentachlorphenate (santobrite) is an effective and cheap preventive of mildew, while of recent years successful use has also been made of non-toxic higher tertiary alkyl phenols—*e.g.*, abracide, which inhibited cellulose moulds at 1 in 6,000 and *M. mucedo* and *A. glaucus* at 1 in 4,000, and is supplied in a 5 per cent. solution made up in a 10 per cent. potash castor oil soap solution, used in conjunction with 10 per cent. ethylene glycol. The chemical changes produced by textile mildews are very far-reaching, *P. glaucum*, for instance, having been shown to secrete at least 12 enzymes which decompose the carbohydrates and proteids of the size and produce organic acids tending, in association with a powerful simultaneous reducing action, to destroy the coloured ground of printed goods. Under optimum conditions during manufacturing *Mucor* moulds may proceed from germination to fructification in 24 hours.

411. The Effect of Cotton Seed Dusting on Emergence of Seedlings in Soil Infested with *Rhizoctonia*. By W. W. Ray. (*Phytopathology*, xxxiii., **1**, 1943, p. 51. From *Rev. App. Mycol.*, xxii., **6**, 1943, p. 205.) A tabulated account is given of a series of tests at the Oklahoma Agricultural Experiment Station in the control of *Rhizoctonia solani* on Deltapine cotton grown in heavily infested greenhouse soil, by seed-dusting with a number of chemicals. Emergence was substantially improved by treatment with new improved ceresan, Du Bay 1155-HH (ethyl mercury iodide), Du Bay 740-A (ethyl mercury borate), Du Bay 1228-R (methyl mercury naphthol sulphamide), and spergon, all applied at the rates of 3 gm. per kg. seed; but the differences in the subsequent survival of plants from the disinfected and control lots were not statistically significant, so that the practice of seed-dusting cannot be regarded as an effective means of combating post-emergence damping-off of cotton seedlings in soils containing an abundance of inoculum of *R. solani*.

412. Cotton Root-Rot Control in the Punjab. By R. S. Vasudeva. (*Ind. Frmg.*, iii., **11**, 1942, p. 592.) A brief semi-popular account of the various experiments in the Punjab for the control of cotton root rot by mixed cropping.

413. Cotton Root-Rot Studies with Special Reference to Sclerotia, Cover Crops, Rotations, Tillage, Seeding Rates, Soil Fungicides, and Effects on

Seed Quality. By C. H. Rogers. (*Bull. No.* 614, Texas Agr. Exp. Sta., 1942.) Sclerotia, the resting bodies of the cotton root-rot fungus, have been found to a depth of 8 feet in the Blackland soils and in quantities of several million per acre in the first 3 or 4 feet of soil. The reductions in number of sclerotia following crop rotations and green manuring were scarcely large enough to explain the partial control of root rot obtained by these practices, suggesting that the beneficial effect may be on the active stage of the fungus in the soil or directly on the cotton plant. With the usual cotton-corn-oats rotation in which the oats were followed by summer catch-crops of cow peas and sorghum ploughed under for green manure in late summer, the yield of lint cotton in 1941 was greater by 100 lb. per acre in the plots receiving this treatment than in continuous-cotton plots, and the amount of root rot was 20-30 per cent. less. Similarly, in 1941, the yield from cotton following ploughed-under Hubam stubble (after harvesting for hay or seed) was twice as large as the yield from continuous-cotton plots, and root rot was reduced from 70 per cent. to 15-20 per cent. Early ploughing under of cotton stalks in 1940 resulted in a yield increase of 120 lb. seed cotton per acre in 1941, as compared with the usual late turning in of the stalks. Sesbania, guar, and certain selections of cowpeas showed resistance to root rot and may prove valuable in rotations designed for root-rot control and soil improvement. In a 3-year study, cotton seed was planted at rates of 2, 5, and 10 seeds per hill in hills 18 inches apart, and the stand was thinned to not more than 2 plants per hill at the time of chopping. The plots with the fewest seeds per hill had the least root rot at the end of the season. Subsoiling or tillage to depths of 15 inches or greater reduced root rot but no outstanding increase in yield was obtained. Treatment of the soil with certain fungicides, such as crude oil, was effective when applied sufficiently deep.

414. Cotton Root Rot, the Weather, and Cotton Yields. By W. N. Ezekiel. (*Trans. Tex. Acad. Sci.*, xxv, 1941, p. 63. From *Rev. App. Mycol.*, xxii., **4**, 1943, p. 135.) Many of the observations included in this survey of the relation of weather conditions to cotton root rot (*Phymatotrichum omnivorum*) have been previously discussed, but the author's interpretation of the final picture of the influence of rainfall on the host and parasite may be mentioned. Both respond in somewhat the same manner to this factor. Thus, in years of "favourable" rainfall comparatively high yields may be obtained even in areas where the disease is prevalent, but the output is very much lower than it would be in the absence of the fungus, the development of which is likewise promoted by continuous humidity. In other words, the root rot tends to equalize yields on the particular farms affected at drought level.

[*Cf.* Abstracts by same author in previous volumes of the Review.]

415. Experiments toward the Control of Take-All Disease of Wheat and the *Phymatotrichum* Root Rot of Cotton. By F. E. Clark. (*Tech. Bull. U.S. Dept. Agr.*, 835, 1942. From *Rev. App. Mycol.*, xxii., **4**, 1943, p. 129.) In connection with root rot of cotton, uncontaminated, viable sclerotia of *Phymatotrichum omnivorum*, the agent of cotton root rot, survived as well in sterile, organic-amended, as in sterile, untreated soil, suggesting that the destruction of these organs is effected by the saprophytic microflora. Widely differing types of organic material, including starch, cellulose, ground wheat straw, ground lucerne hay, crimson clover and hairy vetch tops, and commercial peptone, were successfully used at rates of 0·5 to 5 per cent. for the extermination of the sclerotia from both Hunt clay and Wilson loam soils given either the high- or low-nitrogen type of amendment; the incidence of elimination from washed sand was slightly poorer. In tests to determine the influence of the incubation temperature and soil moisture on the efficacy of the organic substances against *P. omnivorum*, 12, 30, 72, and 91 per cent., respectively, of the viable sclerotia were destroyed at 2°, 12°, 28°, and 35° C., respectively, and 59·5, 66·2, 76·7 per cent., respectively, at 35, 38, and 80 per cent. of the moisture-holding capacity of amended Hunt clay, the corresponding percentages for unamended soil being 37, 38, and 33. Cutting healthy cotton roots below the crown was found to hasten their colonization by saprophytic fungi, no such effect following the infliction of injuries above the crown. From plants parasitized by *P. omnivorum* but not

mechanically injured, *Penicillium* and *Trichoderma* spp., Dematiaceæ, and sterile mycelia were encountered with greater, and *Aspergillus* spp. and Mucorales with less, relative frequency on root segments incubated in the moist chamber. About two-thirds of all the root segments recovered from healthy, unwounded plants were free from saprophytic fungi, which developed, however, on four-fifths of those clipped below the crown; at the same time, this practice contributed to the rapid disappearance of the root-rot organism from its host.

416. TAP-ROOT DAMAGE OF COTTON, ASCRIBED TO TERMITES, IN THE SUDAN GEZIRA. See Abstr. **293** of this issue.

417. STUDIES IN THE PERIODIC FAILURES OF THE PUNJAB-AMERICAN COTTONS IN THE PUNJAB. VII. AMELIORATION OF *Tirak* ON SOILS WITH SALINE SUBSOILS. By R. H. Dastur and M. Singh. (*Ind. J. Agr. Sci.*, xii., **5**, 1942, p. 679.) *Tirak* or bad opening of bolls in the Punjab-American cottons on soils with saline subsoils is mainly caused by a disturbance in the water balance of the plant. A water deficit arises in the plants toward the fruiting stage, which is the most critical period of plant life, and becomes more pronounced as time goes on. Salinity in the subsoil renders the absorption of water difficult and the plants succumb to the physiological drought. Replicated field experiments were conducted to study the effects of the following three types of ameliorative measures during the cotton seasons of 1938-39 to 1940-41 on such lands where subsoil salinity was known to exist and where *tirak* had previously occurred: (1) applications of gypsum, silt, farmyard manure and green manures, (2) washing down of the salts from the feeding zones of the roots by flooding of such lands, and (3) preventing the development of a water deficit by means of late sowings or by giving extra applications of water at the fruiting stage. No success was achieved with the first two measures, but the third—deferred sowings and extra applications of water from the flowering stage—proved successful in remedying *tirak*.

[*Cf.* Abstrs. **724**, Vol. XVI, **238**, Vol. XIX, **17**, Vol. XX.]

418. EL VERTICILLIUM-WILT DEL ALGODONERO. By T. Boza Barducci and G. C. Rada. (*Bol. Estac. Exp. Agr. La Molina* 23, Lima, Peru, 1942. From *Rev. App. Mycol.*, xxii., **5**, 1943, p. 166.) The species of *Verticillium* responsible for cotton wilt in Peru has been determined as *V. albo-atrum*, the optimum temperature and hydrogen-ion concentration for which in cultures on Czapek's, potato dextrose, and potato peptone dextrose agars were found to be 22° C. and *p*H7, respectively. The pathogen, which produces a systemic disease in its host, may easily be isolated from fresh material, the tips of the plant and of the branches and the secondary rootlets yielding the maximum percentages of fungal colonies (43·7, 59·5, and 43·4, respectively, compared with 34·3, 26, and 6·2 for the petioles, boll peduncles, and tap root, respectively).

419. SOIL MOISTURE AND WILT DISEASE. (*Nature*, 24/6/43, p. 107.) In the Niagara Peninsula in 1940 wilts due to *Verticillium albo-atrum* R. and B occurred on a number of hosts, and Colin D. McKeen reports in the *Canadian J. Res.*, March, 1943, the results of an extended series of investigations designed to ascertain the factors leading to such epidemic outbreaks, which occur only occasionally in the Peninsula. It is found that there is a very definite optimum temperature for the development of the pathogen in the soil and that an outbreak of disease is only to be expected when such soil temperatures coincide with the presence of relatively high values of soil moisture. This only occurs rarely in this locality, which thus usually escapes serious injury from *Verticillium* wilt, because of the low soil moisture throughout that part of the growing period during which soil temperatures favour the growth of the fungus.

GENERAL BOTANY; BREEDING, ETC.

420. THE MATERIAL BASIS OF EVOLUTION. By R. Goldschmidt. (Oxf. Univ. Press, 1940. 30s. Reviewed *Pl. Bre. Abs.*, xiii., **2**, 1943, p. 171.) This book presents an elaboration of the material contained in the eight Silliman Lectures delivered by the author in December, 1939. It is commended to the attention of all geneticists and indeed all who are in any way concerned with the science or practice of breeding,

whether of animals or plants. Many voices have been raised, especially in the last few years, against the views of the classical geneticists and neo-Darwinians, but few, if any, have the backing of such a body of experimental data and the authority of such a wealth of experience as that with which Richard Goldschmidt presents his case. The author discusses firstly micro-evolution which, he concludes, proceeds within the species by the accumulation of small mutations. These, however, never lead to the formation of incipient species or higher categories, which originate by single macro-evolutionary steps. A great weight of evidence is presented to show how a single change—*e.g.*, one affecting the early embryonic processes—may affect the entire organism in just such a way as is characteristic for the differences between species, genera or higher orders. The changes in question often involve a difference in velocity of some process—*e.g.*, a catalytic reaction—and have been well studied by many animal geneticists and physiologists; unfortunately, the plant kingdom remains largely an unexplored field in this respect, and this may be the reason why the neo-Darwinian principles of speciation by selection and accumulation of unit differences are so slow to be uprooted. The rôle of selection is of course not denied; we read: " The formation of a rassenkreis of sub-species (including the still lower categories) is the method by which a species adapts itself to different local conditions within the area which it is able to inhabit. This adaptation, strictly within the limits of the species, is produced by micromutation in different directions, involving all known types of Mendelian inheritance of manifold morphological and physiological traits. Selection by pre-adaptational combinations accounts for everything else." The differences between true species, however, constitute something more profound, and are on a different genetic level, involving differences in reaction systems, instincts, etc., and there is a bridgeless gap between them. Chromosome rearrangement is one of the suggested ways in which the major change producing species differences may be brought about. " More and more facts are accumulating which show that the intimate serial pattern of the chromosome is important for the action of the hereditary material." Chromosome breaks which lead to new serial arrangements may produce definite genetic effects which are not different from the typical effects of mutations. The effect of regrouping the components of a chromosome are compared with that of regrouping the components of many known chemical compounds—*e.g.*, the male sex hormone, which has certain stereoisomeres that are without any effect at all; changes of this kind can produce systemic mutations, not involving the creation of anything new but sometimes entailing immense phenotypic changes of a macro-evolutional order. It will be seen that all this may come about without the intervention of the gene as such, and the classical atomistic theory of the gene is not indispensable, it is found, either for genetics or evolution. Such a view of evolution, arrived at from a study of the animal kingdom, is in striking consonance with those arrived at by careful studies of floral evolution by such careful observers as Willis and Guppy; it has the advantage of verisimilitude, in that a systemic mutation of the kind described leads at once so far toward the new type that selection can immediately be efficacious. The various improbable assumptions of the neo-Darwinians to explain the survival of the intermediate steps are thus no longer necessary. A change identical with many known mutations can often be produced also by purely environmental means such as alterations of temperature, hormones, or other agencies which affect the velocity of reactions; these effects are known as phenocopies and provide a powerful example of how a complex macro-evolutionary change can be produced by an exceedingly simple mechanism.

421. EVOLUTION IN PLANTS BY KALEIDOSCOPIC MUTATION. By J. C. Willis. (*Proc. Roy. Soc., Ser. B*, **131**, 1942, p. 161. From *Pl. Bre. Abs.*, xiii., **2**, 1943, p. 106.) The theory is elaborated that evolution proceeds from the family, through genus to species. The endemic type is shown to be the young form and not a refugee, and the mutating ancestor must be assumed to possess all the contrasting characters though they are not all shown, hence the analogy with a kaleidoscope.

422. REGENERATION, DEVELOPMENT AND GENOTYPE. By C. E. Allen. (*Amer. Nat.*, **76**, 1942, p. 227. From *Pl. Bre. Abs.*, xiii., **3**, 1943, p. 210.) In this paper, one

from a symposium on "Growth and Differentiation in Plants," the author discusses the genotype, its potentialities and limitations in regeneration and development. While the germ cell can reproduce the complete genotype, somatic cells vary considerably in their capacity to reproduce even cells like themselves. A review of some of the outstanding facts of regeneration, from the formation of the complete genotype from one somatic cell to cells incapable of division, leads to the suggestion that the cytoplasm may play an important part in determining the capacity of the nucleus.

423. TAXONOMY AND PHYLOGENY. By W. B. Turrill. (*Bot. Rev.*, **8**, 1942, pp. 247, 473. From *Pl. Bre. Abs.*, xiii., **1-2**, 1943, pp. 24, 122.) In Pt. I, the principal advances in taxonomy are stated to be due, among other factors, to the inclusion of results from modern advances in the study of genetics and cytology. Pt. II. deals very fully with two main aspects of the problem of the relation between taxonomy and phylogeny, namely: (1) taxonomic and phylogenic concepts and criteria, and (2) data used in classification and phylogenetic studies; the latter section includes special sub-sections dealing with the cytological and the genetical contributions. In discussing the value of ecological and phytogeographical data, the author expresses the view that "though phytogeography has much light to throw on phylogeny and much help to give taxonomy. . . . full and careful analysis is essential before synthesis." Pt. III. deals with classification and phylogeny in major plant groups; logical as opposed to phylogenetic classification; phylogenetic diagrams and the summing up. In the final discussion of this comprehensive and suggestive review the writer pleads for the use of more inductive methods in phylogenetic investigation (especially in the angiosperms). He also considers the main question of how far a known phylogeny can be incorporated in an improved classification, and further points out the limitation that should be imposed in the use of phylogeny in a general classification. In conclusion, the increasing difficulty of fitting the results of modern studies in autecology and genetics into the existing scheme of taxonomic nomenclature is indicated, and this fact and its relevance to phylogenetic research too is recommended to the urgent attention of biologists.

424. THE RELATIONSHIP OF AGRICULTURAL SCIENCE WITH TAXONOMY AND CYTOLOGY. By W. Burns and B. P. Pal. (*Roy. Bot. Gdn., Calcutta*, 1942, **150**, 23-1—23-6. From *Pl. Bre. Abs.*, xiii., **3**, 1943, p. 178.) The authors review the work on the geographical distribution, genetical behaviour, and chromosome numbers of cotton, sugar-cane, and rice; they also give the general concepts of the classification, origin, and evolution of the above genera and their species, which have been deduced from the work under review. Mention is made of the classification of cotton and rice prepared by two sub-committees of the Imperial Council of Agricultural Research in collaboration with the Indian Central Cotton Committee.

425. DIVISION OF PLANT BIOLOGY. By H. A. Spoehr *et al.* (*Carnegie Inst. Washington, Yearbk.*, **40**, 1940-41. From *Exp. Sta. Rec.*, **87**, 4, 1942, p. 485.) Progress reports are included on the results of fundamental investigations of photosynthesis said to be of such significance that virtually all hypotheses thus far advanced to account for its mechanism must be abandoned or drastically revised; on experimental taxonomy approached from the morphologic, geographic-ecologic, genetic, and cytological standpoints; studies of the conditions determining the types of vegetation found growing naturally in uncultivated areas; and paleobotanical investigations as providing an historical viewpoint for botany. The more detailed reports cover: "Biochemical Investigations" (Spoehr *et al.*), including studies of the organic nutrition of plants, use of radioactive CO_2 in photosynthesis, the state of pigments in leaves, isomerization of carotenoid pigments and olefinic fatty acids, and oxidation-reduction reactions in leaves; "The Quantum Efficiency of Photosynthesis" (R. Emerson and C. M. Lewis); "Ecology," including adaptation and origin (F. E. Clements *et al.*), and climate, climax, and conservation (F. E. and E. S. Clements); "Paleobotany" (R. W. Chaney).

426. CERTAIN PHYSICAL PROCESSES AND THE PRODUCTION OF GENE MUTATIONS BY IRRADIATION. By K. G. Zimmer and N. W. Timofeeff-Ressovsky. (*Z. indukt. Abstamm.- u. Vererb. Lehre*, **80**, 1942, p. 353. In German. From *Pl. Bre. Abs.*, xiii., **2**,

1943, p. 121.) The use of very dense ionizations produced by neutrons led to a reduction in the mutation rate, once more suggesting the existence of a sphere of action (Treffbereich) of finite dimensions, within which a second hit produces no further effect. The size of this sphere of action has been calculated theoretically as of the order of magnitude of 1,000 atoms, which agrees well with that found in practice, assuming that a single mutation is produced by a single ionization and not by a group of ions. The results can be interpreted satisfactorily without assuming the transference of energy indirectly by activated molecules, and the authors find no reason to alter their earlier views on the mutation process.

427. INDORE INSTITUTE OF PLANT INDUSTRY: RESEARCH WORK, 1941-42. A progress report of the work carried out in connection with the following:

1. *Genetics.*—(*a*) Study of the major factors in *Gossypium arboreum* and *G. hirsutum* cottons: leaf shape; anthocyanin; lintlessness; fuzziness and X-ray variations. (*b*) Wilt resistance in *G. arboreum* cottons. (*c*) Study of the potentialities of different ecotypes with regard to combination of economic characters. (*d*) Genetics of quantitative characters.

2. *Cytology.*—(*a*) Study of the colchicine effect on hybrids and wild cottons. (*b*) Chromosome morphology of inter-*arboreum* hybrids.

3. *Physiology.*—(*a*) Investigations into simple methods of fibre weight determination in earlier stages of plant-breeding work. (*b*) Study of competition effects between *desi* and selected Upland cottons in a mixed crop (final trial). (*c*) Study of the survival of Upland and *desi* cotton in a mixture. (*d*) Factors which give rise to undeveloped ovules and immature fibres in different cottons. (*e*) Simple experiments on germination in cotton and on relationship of size of seed to plant vigour.

4. *Statistics.*—(*a*) Effect of selection on genetic variance in cross progenies. (*b*) Application of discriminant function in cotton breeding. (*c*) Statistical analysis of existing data.

428. POLYGENIC INHERITANCE AND NATURAL SELECTION. By K. Mather. (*Biol. Rev.*, **18**, 1943, p. 32. From *Pl. Bre. Abs.*, xiii., **2**, 1943, p. 105.) The author expounds the principle of multiple genes and explains certain ways in which their behaviour differs from simple genes. One of these is the manner in which potential variability may be freed by segregation and thus provide the material for selection; with polygenes the process becomes very complicated and very close adjustments are possible, while maintaining the balance between fitness and variability. This potential variability, released by recombination, provides an explanation for the great and prolonged changes that can be brought about in plants and animals under the influence of selection. The rate at which the potential variability is released is controlled not only by the recombination frequency, but by the arrangement of the polygenes in the chromosome. Heterosis is regarded as an expression of lack of balance resulting from selection and hence is seldom to be found in wild populations. The variability produced by mutation is in the case of polygenes mostly potential and is only gradually released to be acted upon by selection. The breeding system is an adaptive character, inbreeding leading to immediate fitness but lack of flexibility, outbreeding to the reverse. The author regards polygenes as the main mechanism even in such operations as heterogeneous breeding systems (pin and thrum, etc.) or sex separation, which are operated by "switch" genes. In this he represents a viewpoint distinct from that of Goldschmidt, who regards the polygenes as secondary and the "switch" mechanism as the fundamental.

429. POLYGENES AND OLIGOGENES. By C. H. Waddington. (*Nature*, **151**, 1943 p. 394. From *Pl. Bre. Abs.*, xiii., **3**, 1943, p. 180.) It is pointed out that no true distinction can be made between polygenes and oligogenes such as is attempted by Mather; in fact a single gene may be polygenic with respect to one character and oligogenic with respect to another. It is suggested that these terms should be discarded or used only with qualifications.

430. COLD SPRING HARBOUR SYMPOSIA ON QUANTITATIVE BIOLOGY. Vol. X. THE RELATION OF HORMONES TO DEVELOPMENT. (Biol. Lab., Cold Spring Harbour,

L.I., New York, 1942. Reviewed *Pl. Bre. Abs.*, xiii., 3, 1943, p. 273.) The Cold Spring Harbour Symposia have justly earned a high reputation for bringing together in a constructive way contributions which, though based on widely different experimental material and techniques, yet bear on some common feature of fundamental importance in biology. The 1942 Symposium gives an invaluable survey of our present knowledge of the rôle of hormones in the development of plants and animals of higher and lower orders. In terms of the rate of advance of biological science it is now a long time since the notion was clearly advanced and widely accepted, that the working of genes would have to be explained in terms of substances of high physiological activity, operating at low concentrations. In the sense that no single gene has yet had its operations explained in purely chemical or biochemical terms, there is still much ground to be covered before the effects of genes in the life history of the individual are as well understood as their passage from generation to generation. But the papers given at this symposium show that at least some of the main routes across this new country are being mapped. Much of the work reported is physiological rather than genetical, providing the basic knowledge which will later be used as a guide in investigating genetic differences. The work on animals, especially mammals, having a longer history, is more detailed and generally more advanced than on plants. The reader, however, who has been out of touch with work on plant hormones and development for two or three years will be amazed at the leaps forward which have been made. New groups of physiologically active substances have been discovered having formative effects on leaves, as well as affecting cell enlargement. The development of embryos *in vitrio* can now be controlled with considerable exactness, and the development towards flowering of short-day plants can be analysed in terms of the production of precursors of a, as yet hypothetical, flower-producing hormone. The book is well worth studying for the new ideas set forth, for the new techniques described, and also for the discussions reported after each paper. It is illustrated by line drawings and half-tone plates, and an index is provided.

431. Some Czechoslovak Contributions to Genetics (1866-1938). By Dr. G. Druce. (*Nature*, 1/5/43, p. 495.) Discusses the work of Gregor Mendel and that of Dr. Arthur Brozek, the first professor of genetics in the Charles University of Prague. Notes are also included of the work of Professors Bilek, Krizenecky, Matiegka, Helfort, and others.

432. Production Genetics in Sweden. By C. D. Darlington. (*Nature*, 13/2/43, p. 183.) During a recent visit to Sweden the author had the opportunity of seeing the important breeding work that is being carried out by that country. The organization of the plant-breeding work at the Svalov stations is described, together with the use of modern methods of plant breeding, more particularly the value of colchicine in the production of polyploids. The co-ordination of the work of the various research institutes and universities with a national policy is held to be of primary importance.

433. Genetics of Petal Colour in Asiatic Cottons. By B. Nath. (*Ind. J. Genet. Pl. Breed*, 2, 1942, p. 43. From *Pl. Bre. Abs.*, xiii., 2, 1943, p. 111.) "It is shown that 2 factors, *Ya* and *Yb*, are necessary for the production of yellow petal in Asiatic cottons. *Yb* is shown to assort independently of the gene R_2."

434. The Chromosomes. By M. J. D. White. (Methuen and Co., Ltd., London, 1942. Price 5s., 2nd edn. Reviewed *Pl. Bre. Abs.*, xiii., 2, 1943, p. 172.) The second edition differs from the first in that a short section on the chemical composition of chromosomes has been incorporated in Chapter II, and the final chapter, on chromosomes and evolution, has been rewritten.

[*Cf.* Abstr. 372, Vol. XV. of this Review.]

435. Induced Chromosomal Changes and their Significance in Growth and Development. By J. M. Beal. (*Amer. Nat.*, 76, 1942, p. 239. From *Pl. Bre. Abs.*, xiii., 3, 1943, p. 212.) Reviews the various ways by which chromosomal changes may be induced, including X-rays, temperature changes, various chemicals and polyploidy, and discusses briefly their value to the plant—in the part they play in species formation.

436. CHROMATIN BRIDGES IN COTTON. By N. K. Iyengar. (*Ind. J. Agr. Sci.*, xii., **5**, 1942, p. 785.) Chromatin bridges were noticed at anaphase I, metaphase II, and anaphase II of meiosis in F_1 triploid hybrids between Asiatic and American cottons. The number of such bridges at metaphase II varied from one to four per nucleus, indicating that structural changes had taken place in more than one bivalent. In the hybrids examined no abnormal configurations at metaphase I, as unequal bivalents, etc., could be clearly observed. The bridges at metaphase II were long and thin and their persistence at this stage indicated that the bridges formed at anaphase I were not broken. The formation of a bridge at anaphase II in one of the sister cells indicated that a loop chromatid must have been formed at anaphase I as a result of an inversion pairing and two cross-overs having taken place, one in the inversion region and one in the region proximal to it, in which only one chromatid was involved in both the cross-overs. A monocentric loop and a fragment would be formed at anaphase I. The loop chromatid formed a bridge at anaphase II, the centromere having divided. These results indicate that in the triploids under study both numerical and structural changes take place. Both of these factors may contribute to the sterility of the hybrids. The structural changes lead to the formation of new chromosomes which may prove to be of evolutionary significance.

437. RECENT WORK ON GERMINATION. By M. A. H. Tincker. (*Proc. of Linn. Soc. of Lond., Session* 154, 1941-42, Pt. 2, 19/2/43.) A review of recent literature on the subject given under the headings of: Longevity and Storage Conditions; Hard Seeds; After-ripening and Stratification; Epicotyl Dormancy; Alternating temperatures; Grasses; Light; Oxygen; Size and Maturity of Embryo; Examples of Chemical Stimulation and Inhibition; Growth Substances; Fungal Invasion; Soil and High Temperature; Miscellaneous; Seed Germination and Lunar Phases; Rapid Methods of Determining Viability; Cytology and Dormancy; Seed Treatment and Aftergrowth.

438. PASSAGE OF AIR THROUGH PLANTS AND ITS RELATION TO MEASUREMENT OF RESPIRATION AND ASSIMILATION. By V. F. C. Glasstone. (*Amer. J. Bot.*, **29**, 2, 1942, p. 156. From *Exp. Sta. Rec.*, **87**, 4, 1942, p. 492.) Examination of 17 plant species indicated the passage of air through their tissues both in the direction of leaf to root and the reverse. There was an approximate proportionality between the amount passing and the applied pressure, and the results were reproducible. Age, size, and moisture condition of the plant were factors apparently affecting the rate of passage. It is suggested that although individual and specific differences occurred in the ability to allow air passage, those differences are believed to be matters of degree only. The rapid passage of air through plants was demonstrated in connection with measurement of CO_2 produced in respiration.

439. THEORIES OF BREEDING AND THEIR APPLICATIONS. By M. Yamazaki. (*Bot. and Zool.*, **6**, 1938, p. 106. From *Pl. Bre. Abs.*, xiii., **2**, 1943, p. 121.) The writer formulates his views on plant breeding and genetics under various heads, including the technique of propagation (regulation and acceleration of flowering), pollen storage, sterility, interspecific hybridization, induced mutation, parthenogenesis, resistance to disease, drought and cold, techniques (including micro-cultures in the study of ecological characteristics) and chromosome numbers as a means of identification of varieties.

440. A NEW METHOD OF PLANT BREEDING. By J. W. Boyes. (*Pr. Bull. Univ. Alberta*, 1941, **26**, p. 5. From *Pl. Bre. Abs.*, xiii., **2**, 1943, p. 106.) Describes the use of colchicine in producing new forms of economic plants: chromosome doubling in tobacco has increased nicotine content 50 per cent., tetraploid tomatoes have more vitamin C than diploids, and cotton plants longer and stronger fibres. A more important use of colchicine is the restoration of fertility by chromosome doubling in sterile hybrids between different species and genera.

441. RECENT ADVANCES IN PLANT BREEDING WITH SPECIAL REFERENCE TO THE WORK OF THE IMPERIAL AGRICULTURAL RESEARCH INSTITUTE. By B. P. Pal and S. Ramanujam. (*Roy. Bot. Gdn. Calcutta*, 1942, 150, 24-1—24-10. From *Pl. Bre. Abs.*, xiii., **3**, 1943, p. 178.) In the section of this paper dealing with advances made in plant breeding in countries other than India, the authors review the results

obtained from studies on single plant selection and hybridization, hybrid vigour, the search for new genes, wide crosses, artificial induction of mutation, genetics of physiological characters, vernalization, and plant hormones.

442. HOW PLANT-BREEDING PROGRAMMES COMPLICATE PLANT-DISEASE PROBLEMS. By N. E. Stevens. (*Sci.*, **95**, 2465, 1942, p. 313. From *Exp. Sta. Rec.*, **87**, 4, 1942, p. 527.) This is a general, critical discussion of the problems involved with specific examples including wheat and hybrid corn. In addition to the two well-recognized methods by which the incidence of losses from diseases and insect pests is strongly influenced—viz., weather changes and introduction—a third, the work of plant breeders, is added. Furthermore, two closely related results of breeding programmes are the introduction on a commercial scale of varieties very susceptible to certain, sometimes new, diseases and the modifying effects of new varieties on parasites long known to be commercially important. The number of potential pests is so great and the conditions so complex that no practical tests for disease resistance can cover all possible situations, so "the real test of a new variety is its culture in the hands of ten to twenty thousand farmers."

443. BREEDING DISEASE-RESISTANT CROPS. By F. N. Briggs. (*Science*, **96**, 2481, 1942, p. 60. From *Exp. Sta. Rec.*, **88**, 2, 1943, p. 203.) Referring to a recent paper by Stevens attention is called to the method of backcrossing for avoidance of the danger of introducing genes for susceptibility to one or more diseases when breeding for resistance to another.

[*Cf.* previous abstract.]

444. INFLUENCE OF THE ENVIRONMENT ON THE EXPRESSION OF HEREDITARY FACTORS IN RELATION TO PLANT BREEDING. By S. H. Yarnell. (*Proc. Amer. Soc. Hort. Sci.*, **41**, 1942, p. 398. From *Pl. Bre. Abs.*, xiii., **3**, 1943, p. 210.) The author reviews the work of many investigators who have shown the effect of the environmental factors moisture, temperature, light, nutrition, and many geographic and cultural conditions, on Mendelian factors. It has been shown that appropriate environmental conditions must be present before any gene or gene combinations can have a selective value, either natural or in plant breeding, and that genes of value in one area may be lost by breeding elsewhere. Improvement might be expected in some cases by intervarietal crosses, by accumulating genes from different varieties that may have a favourable effect directly or in combination, and in other cases by out-crossing to available wild forms or making wide crosses among cultivated forms.

445. THE CHEMICAL COMPOSITION OF THE COTTON PLANT AND THE UPTAKE OF NUTRIENTS AT DIFFERENT STAGES OF GROWTH. By L. C. Olson and R. P. Bledsoe. (*Ga. Sta. Bull.*, **222**, 1942. From *Exp. Sta. Rec.*, **88**, 6, June, 1943, p. 760.) The time and rate of absorption of plant foods by cotton were studied, 1939-40, under field conditions on fertilized Cecil and Tifton sandy loams and Clarksville gravelly loam. These soils are acid and low in base-exchange capacities, organic matter, and mineral nutrients. Dry weight on Cecil soil (producing 2,000 lb. of seed cotton) averaged 9,720 lb. per acre, Tifton (495 lb. seed cotton) 6,176 lb., and Clarksville (897 lb. seed cotton) 5,401 lb. The quantity of nutrients (N, P_2O_5, K_2O, CaO, and MgO) absorbed from the three soils totalled 538, 393, and 311 lb. respectively. On the Cecil and Tifton soils the heaviest uptake of nutrients occurred from early-boll formation to maturity, while on Clarksville soil more was taken up during the early-square to early-boll stage. On Cecil soil absorption of nutrients was greatest 105 days after planting, when boll formation was rapid. At 120 days or longer after planting dry weight production and nutrient absorption were largely confined to the bolls. Some translocation of nutrients from plants to bolls occurred at the late growth stages. The amount of nutrients found in the cotton plant exceeded that ordinarily added in fertilizer mixtures, indicating the importance of plant residues in maintaining the fertility of cotton soils. The average amounts of nutrients found in the mature plants for all three soils approximated: N 104 lb., P_2O_5 38, K_2O 97, CaO 132, and MgO 43 lb.

446. COTTON PLANT: DEVELOPMENT AND YIELD; INFLUENCE OF MINERAL ELEMENTS. By A. A. Kuz'menko *et al.* (*Compt. rend. acad. sci., U.S.S.R.*, 1941, **31**, p. 273.

From *Summ. Curr. Lit.*, xxiii., **10,** 1943, p. 265.) Various compositions of nutrient were tested at different periods of plant growth. The highest need for nutrients is the time when the plant has formed 3-4 leaves. The maximum yield of raw cotton is obtained when N : P: K in Hellriegel's solution is 1 : 4 : 1 before flowering and 4 : 1: 4 after flowering, or 4: 4: 4 before flowering and subsequently reduced to 1 : 1 : 1 or $\frac{1}{4}:\frac{1}{4}:\frac{1}{4}$. Tests were also conducted in soil cultures, details of which are given. The experiments aimed at reducing the growing period.

447. Results from Inbreeding Upland Cotton for a Ten-Year Period. By H. B. Brown. (*J. Amer. Soc. Agron.*, **34,** 1942, p. 1084. From *Pl. Bre. Abs.*, xiii., **3,** 1943, p. 241.) Although many plants are injured by inbreeding, some varieties of cotton and other plants have been reported as being unchanged. The characters on which inbreeding might have an effect are given as seed germination, vegetative growth, number of blooms, boll size, earliness as shown by bold opening, staple length, lint percentage, and weight of cotton seed. Over a 10-year period there was an average reduction of 6·2 per cent. in blooming rate, a 9·3 per cent. reduction in boll size, and a 9·3 per cent. reduction in production of seed cotton. The other characters did not show changes of any significance.

448. Hybridization Between Cultivated Asiatic and Cultivated American Cotton Species: A Review. By N. Yamada. (*Jap. J. Genet.*, **16,** 1940, p. 79. From *Pl. Bre. Abs.*, xiii., **2,** 1943, p. 147.) The work of numerous investigators is reviewed, special attention being directed to the fertility of the hybrids. In connection with Tanaka's findings on the use of wiring and ringing in interspecific crossing, the writer points to an instance showing that when an Asiatic species was used as the female parent, with wiring and peeling treatments, no seeds were set.

[*Cf.* Abstr. **151,** Vol. XV. of this Review.]

449. Grafting Experiments with Cotton. By S. G. Stephens. (*Trop. Agr.*, February, 1943, p. 33.) A major difficulty in carrying out experimental work with cotton in a humid climate is the storage of seed. In Trinidad it has been found more satisfactory to maintain all material, other than that required for immediate genetic study, by grafting. In 1939 two experiments were carried out to test the relative suitabilities of various types as stocks. One experiment was designed on a field scale for the purpose of comparing growth rates, earliness of flowering, types of bolling curve, and yields of selected scions on a range of stocks. The scions used were St. Vincent Sea Island (V135), American Upland (Triumph) and P3494s, and the stocks St. Vincent Sea Island (V135), Jamaica Long Staple (J.L.S.), American Upland (Triumph), Gambia 4V, and N.14. The second experiment was carried out on a small scale and was designed to measure the mutual interaction of stock and scion in two varieties, Triumph and V135, as shown by rate of growth of scion and rootstock. In both experiments the method of grafting employed was the "approach" or "bottle"-graft (Harland, 1927). The results are shown in various tables and graphs, and are discussed. It is suggested that the stock becomes adjusted to the requirements of the scion. No permanent effect of stocks on the scions grafted on them was observed. It is shown, however, that the stock/scion adjustment may not be completed during the first season's growth, so that the vegetative vigour and yield of an annual variety may be considerably affected. During the period of adjustment the habit of the grafted plant may be regarded as a compromise between the normal habits of the types providing stock and scion. An interesting aspect of stock/scion adjustment is that when the vigour of two varieties is determined by different limiting factors, the types obtained by reciprocal grafting may be superior to both the original varieties; a phenomenon which is analogous to hybrid vigour is therefore produced. In addition to "general habit" stock/scion adjustment, which was of major importance at high levels of stock vigour, there were indications of a second type of adjustment—viz., the preference of Asiatic scion for Asiatic stock and of New World scion for New World stock, which operated independently, and which was manifested only at low levels of stock vigour. Changes in scion yield corresponding with changes of stock are analogous to changes induced by varying levels of soil fertility. At the lower levels, replacement of one stock by a better one results

456. Lightning Injury to Cotton. By A. L. Smith. (*Phytopathology*, **33**, 2, 1943, p. 150. From *Exp. Sta. Rec.*, **88**, 6, June, 1943, p. 772.) Considerable variation in the general appearance of lightning-struck spots in cotton fields was observed, sudden killing in circular areas resulting in those more frequently encountered. More difficult to diagnose were the somewhat indefinite and variable spots with delayed and dispersed appearance of symptoms, without noticeable centralized killing, and extending over areas as much as 300 ft. in diameter. Immediate killing results from collapse of tissues exterior to the xylem in stems and larger roots. Surviving plants almost invariably exhibit a collar-like enlargement at or just below the soil line where the plants are completely or occasionally partially girdled. This girdling is due to the killing of cortical and cambial tissues in a band usually about 0·5 in. wide. Other symptoms on survivors include irregular longitudinally elongated necrotic areas on the stems. *Rhizoctonia bataticola*, reported as parasitic on certain Asiatic cottons, frequently invades the lower stem and roots of lightning-injured Upland cotton (*Gossypium hirsutum*) in Georgia.

457. The Rôle of Isolation in the Differentiation of Plant Species. By G. L. Stebbins (Junr.). (*Biol. Symp.*, **6**, 1942, p. 217. From *Pl. Bre. Abs.*, xiii., **3**, 1943, p. 211.) Many plant species are instanced to show that geographical isolation, even over millions of years, does not necessarily lead to cross-incompatibility or sterility, and that the degree to which species or races differ morphologically is no criterion of their degree of intersterility. Genetic isolation is thought to have evolved by the gradual accumulation of small differences. Recombinations of these may occasionally result in the sudden production of a new species.

FIBRES, YARNS, SPINNING, WEAVING, ETC.

458. The Mather Lecture. Textile Research and Development. By Sir Robert Pickard, F.R.S. (*J. Text. Inst.*, June, 1943, p. 95.) The science of textiles is a very wide one, and cannot be accurately defined. It embraces portions of almost every form of study to which the name of science has been given, and its practice includes research and investigation. The application of research—the reception of ideas and their utilization—depends upon the education of the people to whom the results may be of possible use, and up to recent years the position has not been very satisfactory. Textile departments in the great majority of the technical colleges teach the textile technology—as distinct from the science—of one fibre only, and there would appear to be no special teacher of rayon technology. A general plea is put forward by the lecturer for the academic world to take more cognizance of general textile technology, including the utilization of rayon. Textile science is a development of the period between the two wars, and during this period the well-known laboratories have been largely devoting their efforts to a meticulous examination of the properties of the different fibres, their characteristics, and behaviour under different conditions. This has led, in the main, to facilitating the choice of fibres for a cloth to fulfil certain requirements, on the one hand, and on the other, to the control and elaboration of what may be called chemical finishes. Three examples are given illustrating the ways in which scientists have been applying their efforts to the improvements of textiles: the self-sealing cloth and water-holding canvases developed by Dr. Peirce; the Velanizing process of Imperial Chemical Industries; and the Tootal Broadhurst Lee Co., Ltd., anti-crease process. Referring to the Shirley Institute, the lecturer said that it has developed from very small beginnings, and its phase of development is still only at the beginning. It has a long way to go yet, but the possibilities for such a scientific institution of serving the cotton, rayon, and silk industries are by no means exhausted. With regard to exact measurements, quality, and control of processes the Shirley Institute has become the scientific bureau for the trade, and should be in a position to advise upon the application of new scientific methods to industry. The Institute has received from the Government one of the new very powerful electron microscopes sent to this country from America, in order that an attempt may be made to apply it to research work in

connection with cotton, rayon, and silk, or to industrial processes. Nearly all textile fibres vary in their characteristics—even the fibres of one given type are very variable —and all are sensitive to atmospheric conditions. Reproducible experiments, therefore, have to be done on an elaborate scale under atmospheric control, and the assistance of a large number of routine workers is necessary. Such conditions emphasize the need for a central research establishment. There is great difficulty in getting the results of research across from the laboratory to the mill owing to a certain temperamental difficulty which is particularly resistant in the textile world: neither the manufacturer nor the worker wants his established order and standard lines upset. The financial resources of research associations have always been strictly limited, and efforts must therefore be directed to getting the best value for the sums expended. For this purpose, the association must be fully informed of, and must thoroughly investigate what the lecturer termed " the economics of production," and in this connection there is a vast field for investigation. To put far-reaching results into practice takes a very long time, and for this reason there is not the same incentive on the part of the industrialist to pay heavily for research work which will benefit his successors. Hence it is also the State's function to foster fundamental scientific research, and the aid provided should be continuous. Incidentally, the State has provided so far 20 per cent. of the total resources of the Shirley Institute. Another important function of a research association is that it provides a connecting link between spinners, manufacturers, and finishers. In connection with the post-war reconstruction period and the rehabilitation of Europe the prospects of mass production of fabrics are discussed, and the need for the development of the industrial research movement is stressed. Reference is also made to the coming development of plastics. With regard to the prospects for synthetic fibres, the opinion is expressed that the use of these will not mean the elimination of natural fibres. Any fibre in general use possesses some little something which the others have not, and it is the choice of these characteristics, relatively to their price, and within the limits of raw material available, which will determine the relative consumption of the different fibres.

459. Cell Wall Substances: Enzymic Degradation. By D. H. F. Clayson. (*Chem. and Indus.*, 1943, **62**, p. 49. From *Summ. Curr. Lit.*, xxiii., **5**, 1943, p. 130.) The nature of hemicelluloses and the digestibility of these compounds by enzymes are discussed. Work on the biological decomposition of lignin and cellulose is reviewed, and the separation of cyto-hydrolytic enzymes is discussed. The conclusion is drawn that as the plant cell wall develops and assumes skeletal functions it becomes more resistant to degradation by biological agencies. The lignification process is associated with this increased resistance, probably for the following reasons: (*a*) Lignin is not readily disrupted by enzymes. It is subject to slow oxidative changes and, judging by the extremely slow decomposition of wood in bogs and deep water, is not affected by reductive changes. (*b*) Lignin in the woody tissue acts as a physical barrier to the penetration of enzymes and other hydrolytic agents and is possibly chemically combined with the uronic acid groups which would otherwise be the more vulnerable points in the remaining tissues. The more mature cell wall substance is also more resistant to enzymic degradation by reason of the complexity of its chemical constitution and consequent diversity of groupings present. If these groupings each require specific enzymes, the enzymes must be present simultaneously in order that uninterrupted degradation may occur, unless some preliminary disruptive process is introduced whereby each enzyme can penetrate its respective substrate. Consideration of the disruptive effect of various mild chemical treatments on textiles suggests that some of the end-products of fermentation, particularly organic acids, may have a similar effect on natural fibres. This disruptive effect may be independent of the enzymic degradation or some of the agents producing it may function strictly as co-enzymes.

460. Cotton Cellulose: Electron Micrography. By R. B. Barnes and C. J. Burton. (*Ind. Eng. Chem.*, 1943, **35**, p. 120. From *J. Text. Inst.*, May, 1943, A256.) When attempts were made to examine whole cotton fibres of the order of 18μ in diameter under the electron microscope the fibres were observed to swell locally,

burst, and become charred. Observations on 15-day and mature cotton fibres which had been mechanically disintegrated in aqueous suspension showed the presence of two rather distinct phases, one fibrous and the other apparently amorphous and extremely opaque to electrons. Electron micrographs obtained at 6,000 diameters are shown.

461. CELLULOSE: HYDROLYSIS. By R. F. Nickerson. (*Ind. Eng. Chem.*, **34**, 1942, p. 1480. From *Summ. Curr. Lit.*, xxiii., **6**, 1943, p. 161.) Samples of cellulose in the form of unmercerized cotton cloth, mercerized cotton, industrial cotton linters, hydrocellulose obtained by boiling linters for 4 hours in hydrochloric acid-ferric chloride reagent, wood pulp, and viscose rayon were digested for 7 hours in boiling 2·4 N hydrochloric acid-0·6 M ferric chloride, and the accumulated carbon dioxide was determined at frequent intervals. Solid residues of hydrocellulose present as dispersions at the end of the runs were recovered. A typical carbon dioxide/time curve is shown and curves are given showing the calculated percentages of cellulose hydrolyzed against time for the various samples. Calculated hydrolysis, observed recoveries, non-crystalline contents, reactivities of crystalline components, and specific viscosities are tabulated and discussed. It is pointed out that the amounts of crystalline and non-crystalline cellulose in the samples vary between wide limits. The reactivity values for the crystalline components suggest that the crystallites of native celluloses are much alike in behaviour. In the case of linters, severe prior hydrolysis does not appear to alter the reactivity. Mercerization and viscose processing seem to produce a substantial increase in crystallite reactivity. Data showing the variation of moisture regain capacity with time of treatment in boiling hydrochloric acid are tabulated and curves are given showing moisture adsorbed by residue from 100 g. intact material against per cent. of intact material hydrolyzed. The data and graphs indicate that, in the adsorption of moisture, the intact samples are heterogeneous. One component is highly hygroscopic, is present in relatively small amount, and is quickly removed (in 3 minutes under the conditions studied) by acid hydrolysis. The other is much less hygroscopic, represents the bulk of the material, and hydrolyzes slowly. Differences between the curves for the different samples are discussed, and it is suggested that the crystallites have different moisture permeabilities. The crystallites of viscose appear to be completely permeable, the crystallites of mercerized cotton less permeable, and those of unmodified cotton more or less completely impervious. The moisture regain data suggest that structural homogeneity is produced by 3 minutes of hydrolysis, whilst the hydrolysis measurements indicate that about 1 hour is required under the conditions of the experiments. It is possible that the 3-minute period represents the amorphous component and the 1-hour period the mesomorphous. The crystallite reactivities seem to vary as the permeabilities.

462. SUBSTITUTED COTTON CELLULOSE: STRUCTURE. By R. Haller. (*Kolloid Z.*, 1942, **98**, p. 332. From *J. Text. Inst.*, April, 1943, A219.) The behaviour towards the usual cellulose reagents of cotton that has been chemically modified (*e.g.*, by esterification or etherification) without loss of the natural structure has been examined, chiefly microscopically. The chemical changes found in various products are shown to be deep-seated or superficial according to whether the reaction mixtures used in their preparation are or are not swelling agents for the resulting ester or ether. The "immunity" of certain products toward substantive dyes is due to the presence of a layer of a non-dyeing substitution product which protects the underlying unchanged cotton. All such "immune" products are dyed red by diamine-blue 3R, not blue as with normal cotton; this behaviour is attributed to the presence in this dye of a fraction of high dispersity.

463. COTTON CARDING. By L. Lunn. (*Text. Wkly.*, **31**, 1943, p. 304. From *Summ. Curr. Lit.*, xxiii., **6**, 1943, p. 141.) A report of a lecture and discussion. Faults in the cotton, such as broken, short and immature fibres and neps, are briefly discussed, essentials of good carding are outlined, a table of average settings is given, and the importance of attention to the condition of the taker-in and to grinding and cleaning operations is pointed out.

464. COTTON CARDS: SPEED. (*Cotton*, U.S., **106**, 11, 1942, p. 107. From *Summ. Curr. Lit.*, xxiii., **6**, 1943, p. 141.) Two answers are given to a question concerning increasing card speeds to increase production and whether the licker-in speed should be increased from 400 to 600 r.p.m. if the doffer speed is changed from 6 to 9 r.p.m. In the first it is pointed out that increases in speed will probably cause a deterioration in quality or an increase in waste, and the results of experiments in which the licker-in speed was increased to values up to 540 r.p.m. are discussed. The effects on breaking strength, waste, etc., were determined. With blended American cotton of Middling grade a speed of 172 r.p.m. is recommended for the card cylinder. In the second answer it is pointed out that reports from 40 mills in Georgia indicate that the average licker-in speed is 433 r.p.m. for an average diameter of a little over 9 inches on the licker-in, whilst the average doffer speed is 9·7 r.p.m. The action of the licker-in and the effects of increasing its speed are discussed, and it is suggested that with a doffer speed of 9 r.p.m. the speed of the licker-in could safely be increased to 475 r.p.m. on American cotton up to 1⅛ inches staple length, probably without having to alter any settings.

465. COTTON FIBRES: FINENESS. By R. R. Sullivan and K. L. Hertel. (*Text Res.*, 1940, xi., p. 30. From *J. Text. Inst.*, May, 1943, A256.) It is suggested that surface per gram is a suitable measure of fineness for cotton fibres. An air-flow method of determining this quantity to within a standard error of 3 per cent. is described and two calibration curves, one for high- and one for low-porosity wads of fibres, are given. Analyses indicate that the mean from single air-flow tests on each of three 0·1 g.-wads gave the same accuracy as did the mean from microscopic measurements of 2,500 individual fibres.

466. FIBRES: FINENESS MEASUREMENT BY AIR PERMEABILITY METHOD. By M. A. Grimes. (*Text. Res.*, **13**. 1, 1942, p. 12. From *J. Text. Inst.*, April, 1943, A204). Details are given of a method and apparatus for the determination of fibre fineness similar to those described by Sullivan and Hertel. A wad of the fibre is contained in a cylinder provided with a plunger with perforated ends and connected to a flask containing oil. A tube forming a manometer is joined to the neck of the flask. Oil is allowed to flow from the bottom of the flask at a constant rate so that air is drawn in to the top through the wad of fibres. This movement produces a pressure change which, when it becomes constant, is read on the manometer. If desired, the surface per gram of fibres can be calculated. By keeping the weight of specimens and the rate of flow of oil constant, the pressure difference values can be used to compare samples. The results of measurements on 36 cottons, the fineness of which had been determined by the weight-per-inch method, are given. The tests were made with the fibres parallel to the direction of air flow. Comparisons of fineness determinations by this method, by the weight-per-inch method and by the surface-per-gram method of Sullivan and Hertel agree closely, showing that the three methods are of approximately equal accuracy as measurements of fineness. It is pointed out that the air-permeability method requires less expensive equipment and less time for learning the technique and for making the determinations than the weight-per-inch method of determining fineness.

467. COTTON FIBRE BUNDLES: STRENGTH. By R. W. Webb. (*Text. Res.*, **13**, 4, 1943, p. 18. From *Summ. Curr. Lit.*, xxiii., **11**, 1943, p. 306.) Tests by the Chandler round wrapped bundle method and the Pressley flat unwrapped bundle method have given an average strength value of 80,000 lb. per sq. in. for American Upland cottons, some results being as high as 106,000 lb. per sq. in. Average values of 85,000-90,000 lb. per sq. in. have been obtained for American-Egyptian cotton, and of 95,000-110,000 lb. per sq. in. for Sea Island cotton. Sea Island fibre bundles containing 1, 2, 3 and 4 turns per bundle, corresponding to 1·60, 3·20, 5·33 and 8·00 twists per in., gave average fibre bundle strengths of 93,500, 80,200, 65,900 and 48,100 lb. per sq. in. compared with 98,900 without twist.

468. COTTON FIBRE STRENGTH TESTER. By E. H. Pressley. (*Amer. Soc. Testg. Mat. Bull.*, No. 118, 1942, p. 13. From *Summ. Curr. Lit.*, xxiii., **6**, 1943, p. 157.) In a rapid method of determining the relative strength of cotton fibres, a ribbon of

proper size is drawn from a prepared bundle, passed through a fine comb a sufficient number of times to remove all neps, trash and short fibres, and then placed in clamps under sufficient pressure to prevent slippage. The ends of the fibres are cut off against the sides of the clamps, the clamps are placed in the testing device, and the ribbon is broken. The number of pounds required to break the ribbon are read from a scale and recorded. The clamps are then removed and the broken fibres recovered for weighing. This weight divided into the number of pounds read from the scale gives the strength index of the ribbon tested. The index is in reality the number of pounds required to break a milligram of cotton of a standard length of approximately 0·460 in. The figure varies from 5·72 lb. for weak fibre to 10·53 lb. for strong Sea Island cotton. A photograph of the tester and a table of experimental results are given. Results are compared with those obtained by the improved Chandler method and the agreement in regard to relative strength is shown to be close. The value of the rapid method for comparing the lint of cotton selections in breeding work is pointed out. A sample whose strength in pounds per square inch is known should be tested in rotation with all samples whose relative strength is being determined so that allowances can be made for changes in laboratory conditions, etc., and a factor determined for translating strength indexes into pounds per square inch.

469. Fibres: Action of Acids; Microscopic Observations. By H. C. Haller. (*Amer. Dyes Rpt.*, 1942, **31**, p. 681. From *Summ. Curr. Lit.*, xxiii., **5**, 1943, p. 125.) A table is given showing the action of 70 per cent. sulphuric acid on cotton, silk, wool, kapok, and other animal, vegetable, and artificial fibres. A few fibres were treated with the acid and measurements were made with the ocular micrometer. Initial reactions, appearances after 10 minutes, and swelling ratios are recorded. Reactions of some of the fibres with 50 per cent. nitric acid are also shown.

470. Bundles of Parallel Fibres: Specific Surface Measurements. By R. R. Sullivan. (*J. App. Physics*, 1942, **13**, p. 725. From *Summ. Curr. Lit.*, xxiii., **5**, 1943, p. 124.) The flow of air through compact bundles of parallel fibres has been studied in order to obtain values of the shape factor k_0 for the channels through which the flow takes place. When the fibres are cylinders and the flow is parallel to the axes, k_0 is an increasing function of the porosity ϵ. For fibres such as cotton, where the shape and size of cross-section change along the fibre length, k_0 changes less rapidly with ϵ. Data are given for this relationship. Examples of specific surface determinations of Aralac, cotton, and viscose rayon fibres by the parallel-flow air permeability method are given, and the results are compared with those obtained by other methods.

471. Textile Fibres: Properties. By W. von Bergen. (*Mech. Eng.*, **65**, 1943, p. 183. From *J. Text Inst.*, July, 1943, A361.) The microscopical structures and physical and chemical properties of wool, silk, cotton, and other fibres are described, and photomicrographs, stress-strain curves, and tables showing elastic constants for various fibres and metals, relative wet breaking strengths of various yarns, and moisture regains, specific gravities and chemical properties of various fibres are given. The influence of fibre properties on manufacturing processes and on finished products is discussed.

472. Cotton Fabrics: Mercerizing. By A. V. Surovaya. (*Khlopchatobumazhnaya Prom.*, 1939, **12**. From *J. Text. Inst.*, March, 1943, A133.) Mercerizing tests were made on three different types of fabrics, differing as to weight in the raw, scoured, and bleached condition. Regardless of the mercerizing process light-weight fabrics were found to mercerize most easily. With increase in the weight of the fabric, the effect of the mercerizing was poorer. The highest mercerizing effect was obtained by treating the fabric in the boiled condition.

473. Cotton Fabrics: Wearing Quality and Fluidity. By A. V. Surovaya and A. P. Zakoshchikov. (*Khlopchatobumazhoi Prom.*, 1939, p. 109. From *J. Text. Inst.*, March, 1943, A149.) The existence of a direct relation between the viscosity of the solution of cuprammonium cellulose and the wearing properties of the fabric was verified experimentally, and a method for the control of the strength of cotton fabrics from this viscosity was developed. The effects of washing and of light on

fabrics in relation to the viscosity of their solutions were studied. In determining the relation between the strength of the individual cotton fibres of various grades and the viscosity of their solutions it is necessary to take into account the area of the cross-section of the fibre.

474. HARGREAVES' SPINNING "JENNY": HISTORY. By W. A. Hunter. (*Text. Wkly.*, 1943, **31**, p. 233. From *Summ. Curr. Lit.*, xxiii., **5**, 1943, p. 115.) A brief history of James Hargreaves and his invention of the Spinning "Jenny." The usual statement that Hargreaves was a weaver of Blackburn is incorrect. At the time of the invention of the Spinning "Jenny" in 1764 he lived in the village of Stanhill, near Accrington. A number of the machines were made between 1764 and 1767, and some were used in a neighbouring mill owned by Mr. Robert Peel. In 1768 a Blackburn mob broke up the machines and ransacked Hargreaves' home. Hargreaves then left Stanhill and settled in Nottingham, and in partnership with a Mr. James established a mill in which yarns for local hosiers were produced on Spinning "Jennies." The patent for the Spinning "Jenny" was not obtained until 1770.

475. COTTON-SPINNING MILL: REORGANIZATION. By J. Airey. (*Text. Wkly.*, 1943, **31**, p. 458. From *Summ. Curr. Lit.*, xxiii., **8**, 1943, p. 209.) A report of a lecture giving an outline of modern practice in cotton spinning, including control testing and estimates of production per machine, and making suggestions for post-war developments. A discussion is reported.

476. POST-WAR MODERN COTTON SPINNING. Pts. II. and III. By J. Buckley. (*Text. Mnfr.*, lxix., March, April, 1943, pp. 115, 161.) Deals with the subject of Cotton Opening and Lap Forming under the headings of: Openers, major cleaners, dust extraction, waste recovery. Photographs and diagrams of the various pieces of machinery described are included.

[*Cf.* Abstr. **238**, Vol. XX. of this Review.]

477. THE INSTALLATION OF FUTURE COTTON-SPINNING MILLS. By J. Buckley. (*J. Text. Inst.*, January, 1943, p. 1.) The author states that the average age of Lancashire mills is 40 years, and only 5 new cotton-spinning mills have been erected in the country since 1918, a period of 24 years. Of the total spindles in existence 72 per cent. are mule and 28 per cent. ring spindles; 70 per cent. of the world's mule spindles are in Great Britain, with their relatively low production capacity and high production costs. In the writer's view these ratios will need to be altered if Lancashire is to maintain her position as one of the leading cotton goods producers of the world. Modern equipment installed in the cotton-spinning mills of Lancashire in the future would assist the solution of some of the major problems now confronting the trade. The writer then proceeds to briefly describe the recent developments in single-process lapping, dust extraction, carding, combing, drawing, lap winding and drawing, multiple coiler drawing systems, high draft and graduated draft speed frames, ring spinning and ring doubling frames, individual electric drives, and the production and use of large packages. The opinion is expressed that for counts up to 100's at least high-draft ring frames should replace mules except in very special circumstances. The correct planning of mills is discussed and the need for attention to cleanliness, air-conditioning, comfort and training of operatives, and welfare and social amenities, is stressed. In conclusion the author emphasizes the importance of planning now for future mills, and suggests that schemes be prepared in readiness to come into operation immediately hostilities cease.

478. THE INSTALLATION OF FUTURE WEAVING PLANTS. By E. Snowden. (*J. Text. Inst.*, May, 1943, p. 89.) The author suggests various improvements in connection with weaving machinery, the training of personnel in future weaving mills, and summarizes the general conditions that should be adopted in order to make the cotton industry more attractive to its employees.

479. A SENSITIVE HUMIDISTAT. By W. O. Williams. (*Sci.*, **95**, 2463, 1942, p. 283. From *Exp. Sta. Rec.*, **87**, 4, 1942, p. 491.) The humidistat described and illustrated possesses a control operated by the differential in temperature between ether-filled wet and dry bulbs, the difference in vapour pressure of ethyl ether contained in the

bulbs due to this temperature difference displacing a mercury column across the platinum contacts sealed in the connecting tubing. Approximate adjustment is obtained by varying the amount of mercury in the manometer tube by adding to or subtracting from a reserve supply stored in the bulbs, and final adjustment is made by swinging the instrument about a pivot.

480. Catalytic Hydrogenation of Cotton-Hull Fibre. By H. R. Henze *et al.* (*Jour. Organic Chem.*, **7**, 1, 1942, p. 38. From *Exp. Sta. Rec.*, **89**, 1, July, 1943, p. 18.) From 300 gm. of cotton-hull fibre there was formed, by the action of 8·11 moles of hydrogen at 250° C. and under pressures of 325-380 atmospheres in the presence of 7 per cent. of sodium hydroxide and Raney nickel, 3·31 moles of gaseous hydrocarbon (chiefly methane), 0·15 mole of carbon dioxide, and 2·39 moles of acidic material. The acidic material was found to contain lower fatty acids, including acetic and possibly propionic and one of the butyrics or both; lactic acid; γ- or δ-hydroxy-caproic acid and the corresponding lactone; and a dihydroxyvaleric acid and the corresponding lactone, with one hydroxyl of the acid in the α-position and the other probably in the δ-position. Under the conditions described cotton cellulose did not undergo hydrogenation at 225°.

481. Illness Caused by Low-Grade, Stained Cotton. By P. A. Neal *et al.* (*J. Amer. Med. Assoc.*, 1942, **119**, p. 1074. From *Summ. Curr. Lit.*, xxiii., **11**, 1943, p. 317.) People engaged in making mattresses and some others in a cotton mill and cotton-processing plants handling a low-grade, dusty, yellow- or brown-stained cotton suffered from an illness coming on a few hours after inhaling cotton dust, characterized by fever, anorexia, nausea, and vomiting, generalized aching and fatigue. Chemical and mycological examination revealed nothing to account for the effects, but bacteriological examination showed the fibres to contain large numbers of rod-shaped organisms, and cultures gave profuse and almost pure growths of a capsulated motile Gram-negative bacillus, classed as a species of *Aerobacter*. The same organism was recovered from the dust of this cotton and from dust in a cotton mill in which "mill fever" had occurred 3 years earlier; normal cotton did not contain it, yielding mixed and much less profuse growths of indifferent bacteria. Extracts of the cotton and filtrates of cultures of this organism contained a heat-stable toxic substance producing vomiting and diarrhœa in cats and eliciting a Schwartzman reaction in rabbits. Intradermal injection of cotton extract or culture filtrate produced severe inflammatory reactions in human skin. The inhalation of infected cotton dust had no distinct effect on six species of animal, but in human volunteers inhalation of either naturally infected cotton dust, dust from normal cotton artificially infected, or filtrates of cultures of the cotton bacterium, produced illness corresponding to that observed in mattress makers. When the material inhaled contained the living cotton bacterium, this could sometimes, but not always, be cultivated afterwards from nose and throat swabs; blood cultures were always negative. It does not appear that the cotton bacterium produced an infection; its effects are considered to be due to an endotoxin. It is pointed out that the illness shown by these investigations to be produced by inhaling the cotton bacterium resembles "mill fever," "Monday fever," and "gin fever" in cotton-mill workers, and other febrile conditions seen in workers in flax, jute, and grain.

482. Art of the Ancients: A Panorama of Cotton and Other Textiles from Earliest Days. By M. D. C. Crawford. (*J. New York Bot. Gdn.*, 1942, **43**, p. 285. From *Pl. Bre. Abs.*, xiii., **3**, 1943, p. 209.) The writer, at the beginning of his paper on the history of the textile development of cotton, remarks that we have not produced a single useful species of plant or animal, since all the economic types come from some earlier age.

TRADE, PRICES, NEW USES, ETC.

483. Cotton Supply and Markets. By J. A. Todd. (*Text. Mnfr.*, June, 1942, and subsequent numbers.) A continuation of the series of articles commenced in June, 1942, giving month by month a review of the cotton situation at home, in the

United States, India, Egypt, and South America. The most recent article (June) states that at home the raw cotton arrivals remained small, though there were increases from the United States; the arrivals are expected to be adequate to meet Lancashire needs. Resumption of overtime working may increase the rate of raw cotton consumption despite shortage of operatives and absenteeism. In regard to exports, shippers have received permission to export additional quantities of fine goods, which is a welcome outlet to spinners of Eygptian cotton.

United States.—Since the announcement in May of the U.S. Government's plan for the stabilization of wages, costs and prices, the U.S. cotton markets have held narrowly around the 20 cent level. Prospective liberal sales of Government-owned cotton at fixed rates have virtually eliminated bull speculation. On the other hand, there has been little disposition to follow the bear side with all the hazards of the 1943 growing season still ahead. The total amount of Government cotton which the Commodity Credit Corporation is offering for sale is 2,701,000 bales, largely of lower grades and short staples. The Corporation, however, is also empowered to take over cotton in the 1941 and 1942 loans and to offer it to the market if the present Government stock fails to satisfy spinners' requirements for the better qualities. Unless a change is made in the Corporation's selling rates there does not seem any likelihood that the dollar price of cotton will fluctuate much from the 20 cent level for a considerable time. On present prospects, the total carryover of American cotton in the United States at the end of July will be little changed from the 10,700,000 bales carried over at the end of last season. April consumption of all kinds of cotton by the U.S. mills amounted to 939,000 bales, compared with 1,000,000 bales in April of last year. Southern crop accounts are generally favourable. Cultivation has apparently suffered little from the shortage of farm labour, and the application of fertilizers has been fully as generous as last season. Very heavy rains in the upper reaches of the Mississippi and the Missouri in the second half of May, however, resulted in widespread flooding, opening up the possibility of cotton land being inundated when the flood waters descend to the Southern States.

India.—Following an advance in Bombay prices to new high war-time levels, the Government of India took strong action to stabilize the market. A decree was issued enforcing the closure of the Bombay futures exchange and the liquidation of all open contracts in the Jarilla contract at Rs. 565 for the May delivery, and Rs. 568 for the July delivery. Prices were also fixed for the closing out of forward commitments in the Karachi futures market. In both cases the official closing out quotations were appreciably below the rates previously ruling in the open market. In order to ensure the distribution of cotton goods to domestic consumers at reasonable prices, the Government of India has announced its intention of stabilizing values throughout the cotton industry from the raw material to the manufactured article. A comprehensive schedule of maximum selling rates is to be established for the various qualities of raw cotton, yarn, and cloth. The Indian cotton textile industry is operating to full capacity. Most Bombay and Ahmedabad mills are working night and day on a three-shift basis. Consumption of home-grown cotton is being maintained at the record high rate of around 4,500,000 bales for the season.

Egypt and Sudan.—Reopening the Mediterranean should improve the prospects for Egyptian and Sudan exports. No official announcement has yet been made regarding the size of the 1943 cotton acreage, but the area is estimated as close to that of last year.

South America.—In South Brazil cottons of Types 3, 4, and 5 will be in ample supply this season. The harvest is estimated at about 1,750,000 running bales. The Brazilian Government has raised this year's loan rate to Cr. $66 per *arroba* (32·38 lb.) for Type 5 cotton, establishing at the same time a ceiling of Cr. $82 per *arroba*. Exports in May were very small, being restricted to odd cargoes destined either for Sweden or Spain.

In 1943 the Argentine crop promises to be more than sufficient to meet the requirements of the domestic mills, and prospects are that the surplus available for export will be around 50,000 bales.

The Peruvian Government estimates the 1942-43 acreage at 20·2 per cent. less than the previous season. If this estimate is accepted by the United States authorities the Commodity Credit Corporation buying rates will be advanced by about 30 per cent. on those established against the 1941-42 crop.

484. COTTON PROBLEMS IN THE POST-WAR PERIOD. By F. Longworth. (*Man. Cham. Comm. Mnthly. Rec.*, 30/11/42, p. 207.) The decline in the export of cotton piece-goods during the period 1933-38, the need for control of the industry under present conditions and also for some measure of control after the war, are discussed. The necessity for modernization of plants and of making the industry more attractive to the operatives is stressed, and the prospects for the export trade, the application of the Atlantic Charter, the need for unity within the industry, and the encouragement of private enterprise, are also discussed.

485. POST-WAR PROBLEMS OF THE BRITISH COTTON INDUSTRY. By Z. Nawrocki. (*J. Text. Inst.*, February, 1943, p. 26.) The cotton industries of the three major countries producing cotton yarn and cloth—the United Kingdom, United States, and Japan—are compared in regard to capacity, output, exports, costs of production, wages, working hours, profits, changes in recent years—particularly in the period 1920-38—organization, and export trade and home trade policies. The author is of opinion that if the British cotton industry in the future relies on export policy, "textile manufacturers will have to bear all consequences of an acute international competition, and should have the means to lower prices as the need may arise. . . . The industry must be prepared for radical modernization of plant and equipment, changes in commercial organization, long working week, two-shift basis, and eventually lower wages." In support of this view the author discusses the recent developments in the textile industries of China, India, and Japan, and the low wages paid in those countries. The suggestion is made that British exporters should concentrate on exporting finished cloth rather than semi-manufactured goods, and particularly on fine, high-priced specialities requiring skilled labour and the best type of equipment. In the case of the adoption of a home-consumption policy, the future of the textile industry will be determined by the amount of the national income, and especially by that part which is in the hands of families with low incomes. If full employment can be maintained and people can enjoy a high and rising level of living, the future of the textile industry is assured. The need for general planning, adopting a far-sighted policy, is stressed.

486. COTTON TRADE: POST-WAR ECONOMICS. By D. Windel. (*Text. Wkly.*, **31**, 14, 1943, p. 16. From *J. Text. Inst.*, February, 1943, A107.) A report of a lecture in which conditions prior to the war were reviewed and proposals made for post-war reconstruction. The proposals include the establishment of an International Central Authority which would (*a*) establish an international currency, (*b*) decide upon a common international language, (*c*) organize the production and distribution of staple primary products in accordance with broad national needs, (*d*) stabilize prices of such products throughout the world in terms of the international currency, (*e*) organize at a later stage the production and distribution of manufactured goods of standard and constant utility, and (*f*) raise living standards in backward countries.

487. SHOULD POST-WAR COTTON PRICES BE STABILIZED? By A. Bryce Muir. (*Text. Mnfr.*, lxix, May, 1943, p. 192.) Methods of rigid fixing of prices suggested by various national or international "planners" and the many difficulties and dangers associated with them are discussed.

488. RECRUITMENT AND TRAINING FOR THE COTTON INDUSTRY. (*Text. Mnfr.*, lxix., April, 1943, p. 146.) A meeting to consider recruitment and training for the cotton industry, convened by the Cotton Board, was attended by the President of the Board of Education in Manchester on March 24. Representatives of employers' and operatives' organizations, of educational authorities, and of other bodies, attended, comprising several hundred delegates. A resolution was proposed and passed unanimously that the delegates welcomed the efforts being made to promote organized recruitment, selection and training of young people for the cotton industry,

recommended the appointment of a Committee, equally representative of employers, workpeople, and educationists, to formulate and supervise the execution of a planned programme, and approved the establishment by the Cotton Board of a special department to administer the plans and policy of the Committee.

489. COTTON OPERATIVES: WELFARE. By J. S. Haydock. (*Text. Wkly.*, 1943, **31**, 129. From *J. Text. Inst.*, May, 1943, A283.) A report of a lecture, opening with a sketch of the history of welfare work in the cotton industry, and offering practical hints on measures to secure cleanliness and reduce accidents.

490. JUVENILE COTTON OPERATIVES: RECRUITMENT. By E. M. Gray. (*Text. Wkly.*, 1943, **31**, p. 488. From *Summ. Curr. Lit.*, xxiii., **8**, 1943, p. 236.) A report of a lecture and discussion on the decline in the numbers of juvenile recruits to the cotton industry, its causes and remedy.

491. COTTON SUBSTITUTE FOR LEATHER. (*Cotton*, M/c, 7/8/43.) Reports from the United States indicate that when scarcity in shoe leather became apparent some months ago, much speculation was exercised over the rôle that the cotton textile industry might play in offering a substitute for leather. It was then recalled that cotton-woven soles for summer type shoes had been successfully manufactured on a small scale. Recent developments indicate that the carpet industry may contribute materially to the production of a substitute for shoe soles. Two carpet manufacturers have established the groundwork for considerable production of this material. Tests conducted by shoe manufacturers have proved the wearing qualities and value of the new material. Chemical treatment of the fabric gives it strong wear and an adequate flexibility. This cotton material for soles will be adaptable for all types of shoes.

ADDENDA.

492. AGRICULTURAL RESEARCH INSTITUTES AND THE FUTURE. By Dr. B. A. Keen, F.R.S. (*Nature*, **150**, 5/9/42, p. 282.) The organization and administration of agricultural research, in common with many other national activities, will receive critical, and it may be hoped, constructive attention as a result of the war. Considerable changes will probably occur in the post-war structure of our agriculture which should be accompanied by appropriate new perspective in the agricultural research, advisory and teaching organizations. The present article deals mainly with research in arable agriculture. In the last hundred years of research in arable agriculture there have been two well-defined stages, the second of which is already changing into a third, and the picture is one of orderly and progressive development. The history of Rothamsted well illustrates the sequence. The first stage—the era of Lawes and Gilbert—was a frontal attack on the problem of practical agriculture: the manuring of crops. The method was one of simple and direct field experiments; the function of the laboratories was to produce a mass of expository analytical data on the soils and crops. Valuable novelties were employed in the method of approach; the problem was detached from its context of crop rotations and agricultural systems by growing each crop continuously. The method well served its purpose, for it was quick, and not only gave new information, but the field results were capable of immediate application to practice. With the death of Lawes and Gilbert the first stage closed. The Rothamsted work had shown that agricultural science had extended beyond the scope of any one man, and that the help of research workers in many branches of science was needed if soil and plant relationships were to be further elucidated. This second stage of agricultural research began with modest resources, but the Development Commission, and especially the war of 1914-18, gave it a great impetus. It has now been running for some 20 years in substantially the form planned by its designer, the late Sir Daniel Hall, and the achievements amply justify the faith of his vision, for the boundaries of agricultural science have been greatly enlarged. There were difficulties to overcome such as the problems of fostering team-work so that the new agricultural science should be a coherent whole, and of providing a suitable environment to ensure that technical applications of the scientific advances would not be missed or ignored by the research workers. The method

adopted was to establish—instead of one single large research institute—a number of smaller institutes, each of which took an agreed broad section of agricultural research as its main concern. Another far-seeing provision was to give each institute the widest freedom of control over its own research programme, for the reason that decentralized control works best. In the past 25 years many members of the institutes have studied the organization of agricultural research in other countries, and many overseas visitors have examined our scheme; the almost universal opinion is that none is better than ours and most are less effective. The freedom of development that characterized the second stage of agricultural research has not only produced the third stage as a logical outcome, it has also provided the technical machinery that makes the next stage possible. The statistical design of experiments to secure comparable results of an ascertained degree of accuracy enables the maximum of information to be obtained from a given amount of experimental effort, by combining several related questions in one design. Thus, problems concerning two or more research institutes could be dealt with in the same experiment. Such a scheme of field experiments would need co-operative control by the interests concerned through a committee which might work under the ægis of the Agricultural Research Council. The committee would be responsible for selecting the programme from the various proposals put forward and for combining the selected problems in the most economical manner. Each experimental site would be typical of an important soil and farming system. It is certain that a system of well-distributed replicated experiments will be of the utmost value to the research institutes; it is equally certain that it will enable rapid answers to be given to many urgent post-war agricultural problems of a practical and economic nature. Lest it should be thought that the scheme outlined is merely another fashionable war-time centralization, the following points are stressed: the need for it was apparent before the war; it is a natural development from a second to a third stage of agricultural research; and, finally, it does not call for any significant changes in the control and administration of the research institutes. Contact with colleagues in various other branches of agricultural research leads the author to believe that among agricultural research workers there is general agreement on the situation briefly discussed here, and on the best method of dealing with it.

493. Industrial Research: Organization in Great Britain. By P. Dunsheath. (*Engineer*, 1943, **175**, p. 106. From *J. Text. Inst.*, April, 1943, A223.) The position of industrial research in Great Britain is reviewed, and the contribution made by industry through its own laboratories, co-operation between firms for the purposes of research, and the scheme by which the Government supports industrial research, are discussed. Tables are given showing the annual turnover and annual Research Association expenditure of various industries; thus the cotton industry is credited with a turnover of £43,672,000 and expenditure on the Research Association of £95,000. The net output and net output per employee in a number of industries are also tabulated. The present system of patents and publication is briefly discussed. Future possibilities of industrial research are considered and the need for closer contact of science and industry is pointed out. It is suggested that university scientists should go into the factories and workshops, interchange of research staffs should be practised, and facilities for taking refresher courses in the universities should be widely extended. It is pointed out that industrial research requires a live central co-ordinating secretariat which would command respect in the industrial world and would be in contact with a first-class scientific, technological and patent library. Some of the duties of such an organization are indicated.

ERRATUM.

Abstr. **33**, line **2**, of June issue: for *J. Agr. Res.*, read *J. Agr. Sci.*

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